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[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

WESTERN GAS ASSOCIATION,
OFFICE OF THE WRINKLE DEPARTMENT,
721 Citizens Building, Cleveland, O.

To the Members of the Western Gas Association: The Wrinkle Department is now ready to receive contributions for the 1903 collection, and I would thank you to please send a sketch or description of any new device or method you may have to the above address.

Any sketch, photograph or drawing, accompanied by a written explanation, of a new idea will be gratefully received, and it is hoped that you will comply promptly by favoring us with a contribution.

Respectfully, W. E. STEINWEDELL,
Editor Wrinkle Department.

BRIEFLY TOLD.

EIGHTEENTH ANNUAL REPORT, MASSACHUSETTS BOARD OF GAS AND ELECTRIC LIGHT COMMISSIONERS.—We are in receipt of the 18th Annual Report of the Massachusetts Board of Gas and Electric Light Commissioners, which volume is, if that were possible, more valuable and interesting than any of its predecessors. It is replete with matter of moment and record respecting the gas and electric lighting industries of the Bay State, and its figures clearly reveal the great growth that is being made in each. In fact, he who would have well-founded ideas respecting how gas is "getting on," even in such a well settled and old settled State as Massachusetts is, will have both basis and knowledge through a study of the compilations of Commissioner Barker and his associates. We are preparing a review of its contents, and in the meantime we hold the idea that every man in a responsible position with any gas company is doing likewise. It might not be amiss to mention that it is not an unusual thing for American strollers through Europe to see a well-bound copy of the Commissioners' latest report occupying a prominent place in the collection of books for frequent reference on the desks of European gas engineers.

NOTES.—

MR. WALTER M. BLINKS has resigned from the service of the Michigan City (Ind.) Gas Light Company to take a responsible place on the force of the General Gas Light Company, of Kalamazoo, Mich.

THE chief executive officers of the Northern Union Gas Company, of New York city, are: President, G. W. Doane; Vice-President, M. M. Graham; Secretary and Treasurer, D. Hamilton.

MR. J. H. COLEMAN, formerly connected with the Anniston (Ala.) Electric and Gas Company, has been appointed Superintendent of the electric plant at Longview, Ala.

"A. T. F.," writing from Houston, Tex., under date of March 28th, says: "The City Council, of Cleburne, Tex., some days ago granted a franchise to the Cleburne Light, Power and Heating Company to construct and operate a gas plant in that place for a period of 30 years. Under the grant construction work must be commenced within 41

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SMITHSONIAN DEPOSIT

months of the signing of the franchise. It is also stipulated that the Company shall supply gas to the city hall, fire station and city jail at a rate not to exceed 50 cents per 1,000 cubic feet, and to the public schools at a rate not to exeeed $1 per 1,000. The rate for ordinary consumers is put at $1.75 per 1,000."

MR. W. P. FISH, whom many of the old-time gas men will remember from his prominent connection with the Utica (N. Y.) Gas Light Company, has been appointed one of the health commissioners of that city.

MR. JAMES R. BOWEN has been appointed Superintendent of the Pottsville (Pa.) Gas Company. He assumed his new duties the 27th ult.

THE amended articles of incorporation of the Boone (Ia.) Gas Company have been filed. The same show that the capital stock has been increasd from $150,000 to $250,000, and that its corporate existence has been extended to 50 from 20 years.

MR. L. R. PETERS informs us that Mr. J. D. Brewer, who arranged for a gas plant in Albion, Neb., something over a year ago, has sold a large part of his interest therein, and the concern has been incorporated. Its officers are: President, John Peters; Vice-President, H. L. Brooks; Treasurer, F. S. Thompson; Secretary, F. S. Dolen.

THE Hopper interest in the Spokane Falls (Wash.) Gas Light Company, which to all intent meant control therein, has been nominally purchased by Messrs. Cyrus Peirce & Co., of Philadelphia. Who the real purchasers are cannot be definitely stated, but it is understood that they are largely interested in the electric lighting interests of Spokane. The Company will be reorganized; but there is little doubt that Mr. W. A. Aldrich will remain in control of the gas end of the revamped Company.

THE Frontier Electric Lighting Company, of Buffalo, N. Y., which seemingly must have close connections with the Buffalo Gas Company, was incorporated March 27th. It is to operate in Buffalo, and in the towns of Tonawanda, Cheektowaga and West Seneca, Erie county. It is capitalized in $800,000, and its Directors are: Alexander C. Humphreys, Fred. Strauss, Stephen Peabody, H. L. Clark, Robt L. Fryer, W. S. Riselay and F. D. Locke.

AT the last meeting of the New England Association of Gas Engineers, Mr. Frederic Egner presented to the Association a number of books on topics related to the gas industry, the understanding being that such books were to become permanent occupiers of the shelves of the Library which the Association is arranging for. In the JOURNAL for March 30th appears a partial list (it will be found on page 483) of the books presented by Mr. Egner, and we herewith name the others. A scanning of the list will show that his gift was a valuable one. The titles of the omitted volumes are:

"Digest of Decisions of Law and Practice, U. S. Patent Office;" by Messrs. D. H. and L. C. Rice. Three vols.

"Robinson on Patents;" by Wm. C. Robinson. Three vols.

"Text Book of the Patent Laws of the United States;" by Albert H. Walker. One vol.

"Appletons' Cyclopædia of Applied Mechanics." Two vols.

"The Analysis, Technical Valuation, Purification, and Use of Coal Gas;" by W. R. Bowditch. One vol.

"A Practical Treatise on the Science and Practice of the Manufacture of Coal Gas;" King's Treatise. Three vols.

"Fuel: Its Combustion and Economy;" by D. Kinnear Clark. One vol.

"A Theoretical and Practical Treatise on the Manufacture of Sulphuric Acid and Alkali, with the Collateral Branches;" by George Lunge. Three vols.

"Dynamo-Electric Machinery: A Manual for Students of Electro-Technics;" by Sylvanus P. Thompson; third edition. One vol.

"A Practical Treatise on the Manufacture and Distribution of Coal Gas;" fourth edition; by Samuel Clegg. One vol.

"A Handy Book for the Calculation of Strains in Girders, and Similar Structures; Consisting of Formulæ and Corresponding Diagrams, with numerous Details for Practical Application;" by Wm. Humber. One vol.

"Proceedings of the American Gas Light Association," from the beginning to, and including the meeting of 1901, with index. Eighteen vols.

"Proceedings of the Western Gas Association (all that are published in book form to date). Three vols.

Nine complete (with index) Volumes of the AMERICAN GAS LIGHT JOURNAL; unbound.

[OFFICIAL REPORT—REVISED BY THE SECRETARY.—CONCLUDED FROM PAGE 488]

THIRTY-THIRD ANNUAL MEETING OF THE NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

HELD IN YOUNG'S HOTEL, BOSTON, MASS., FEB. 18 AND 19, 1903.

SECOND DAY—MORNING SESSION.

SOMETHING FROM THE COMMITTEE ON SELLING GAS.

The President—I see the Committee on Selling Gas is leaving the room. Is there any report to make. Perhaps we are selling all the gas we can make.

Mr. C. J. R. Humphreys—I am sorry, Mr. President, that I have to leave. I am afraid the committee has not any report to make. It has not been able to secure reliable, definite data which it seemed worth while putting in the form of a report. I am sorry we have not been able to do anything more.

The President—A question just handed in may be quickly considered. It is:

> "What gas company in the East has the best arranged office and salesroom for gas appliances?"

I suppose this means that all the members will stand up.

ELECTION OF OFFICERS.

Mr. Fowler—In the absence of the chairman of the Nominating Committee, who has had to leave, I submit the following report: That the present officers all be retained in their positions for another year. This was the result that the committee arrived at after considerable discussion.

On motion of Mr. Coggeshall the report was received and adopted.

On motion of Mr. W. A. Learned, it was determined to proceed with the election of officers. On motion of Mr. C. F. Prichard, Mr. S. J. Fowler was directed to cast the ballot of the Association for the officers as reported by the committee; and Mr. F. C. Sherman was appointed teller. The latter subsequently reported that the result of the ballot was the re-election to office of the gentlemen who served the Association in an executive capacity during the past year.

The President—You have elected the Board of Directors and the officers as they were last year. Speaking for myself, gentlemen, I want to say that I deeply appreciate this honor, and will assure you that I welcome the opportunity to assist the Secretary in the large amount of work that he is going to have on his hands this year. I thank you. [Applause.]

Mr. Richardson—Mr. President and Gentlemen of the Association: I wish to express my appreciation of the compliment implied in my re-election to the office of First Vice-President. If my efforts have been af any avail to assist the other officers, surely it will be a pleasure to continue the same during the present year. I thank you very kindly.

The President—We will now give our attention to the reading of the paper by Mr. W. A. Learned, of Newton, Mass., entitled

NOTES ON HIGH PRESSURE DISTRIBUTION.

Our Company supplies 11 villages with gas, covering about 25 square miles of territory, branching out 3 to 6 miles from the works. The elevation of the territory varies from 18 feet above low water to 240 feet. Four of these villages are on about the same level as the works.

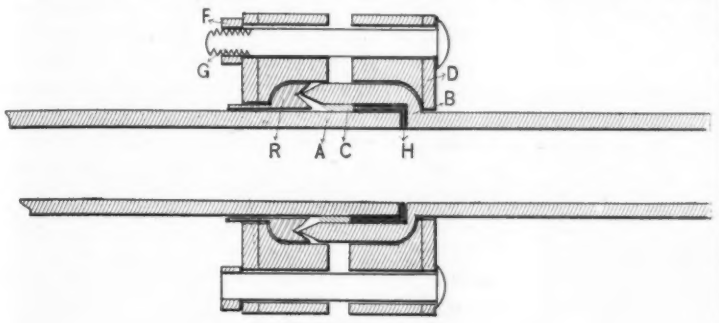
The problem to be solved was to increase the pressure in the 4 villages and fill a holder 3½ miles away which supplies 4 other villages beyond. This was accomplished by the installation of a high pressure pipe line, which is 9,600 feet long, using 6-inch cast iron pipe with special bell and spigot joints and the necessary compressors and condenser. This pipe line under high pressure has the capacity of a 20-inch pipe line, and serves the purpose of a supplementary supply in case of accident to the main low pressure pipe line. This system was designed to take care of the distribution in the territory for years to come by future extensions.

The 6-inch pipe was made of cast iron, by R. D. Wood & Co., with special bell and spigot joints designed by S. R. Dresser, of Bradford, Pa. The Dresser coupling for cast iron pipe requires pipe cast especially for this coupling, having, in place of the regular bell a smaller bell, cast with a bevel edge over which the packing fits, a packing ring of rubber made with a V-shaped recess, and two malleable iron followers or rings which, when drawn up by bolts, compress the rubber and make an absolutely tight joint. The construction of the coupling is such that the rubber is hermetically sealed from all action of the contents of the line or the surrounding earth.

The principal advantages are: The possibility of an absolutely gas tight line for any pressure; the making of every joint a perfect expan-

sion joint, thus doing away with all breaks due to contraction or the settling of the pipes in the trench; the ease and facility with which pipe may be laid on top of the ground and put into the trench afterward; the saving of expense on trenches, owing to the fact that a very much narrower one can be used than is possible where work must be done after the pipe is lowered; and that, by the use of the insulating style of coupling, the line can be made absolutely proof against all disintegration due to electrolytic action.

The illustrations will assist in the description, which may thus be

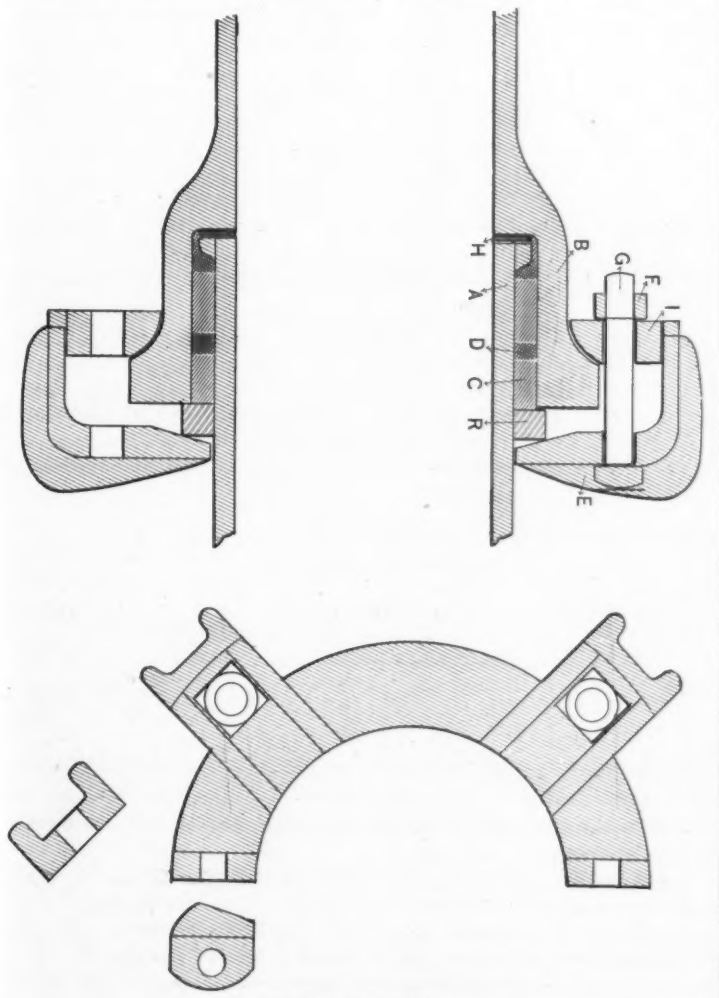


The Dresser Joint.

stated: *A*, spigot; *B*, V-shaped bell of pipe; *C*, cement; *D*, malleable iron ring; *F* and *G*, bolt and nut; *H*, asbestos ring; *R*, rubber ring.

The bends are regular fittings made with cement joints, with the style of clamp marked N and W on the photograph and cross section. The N and W clamp was designed to use on 1 mile of 6-inch pipe that was in the ground, making it a high-pressure line.

Description of the N and W clamp: *A*. spigot; *B*, bell; *C*, cement;



The N. and W. Joint.

D, packing; *E*, ring on face of bell; *F* and *G*, nut and bolt; *H*, asbestos ring; *I*, collar back of bell; *R*, rubber ring.

The last 1,000 feet of pipe was laid with common 6-inch cast iron pipe, cement joints, with N and W clamps, because of the non-arrival of the special pipe and the lateness of the season. All pipes were tested with 40 pounds air pressure. The Dresser pipe was made up on the top of the trench and lowered into position, adopting the practice in use in the oil and natural gas regions. The cement joint pipe was laid in the usual manner in the bottem of the trench. A few hours were allowed for the cement to harden before the clamps were put on. The line was tested every night as the work progressed. The final test of the 2 days showed an absolutely tight line. The pipes were all laid to a grade from 2 to 3 feet below the surface which was above the gas and water services. This was within the frost area, but the dry gas prevents any deposit, the flexible joints preventing any damage to the pipe from the action of frost or when the steam roller was at work on the top of the trench, even upon the cement joints with clamps. It did not matter how poor the cement joint was made, provided there was a hard surface at the face of the bell for the rubber to press upon. Under the worst condition the clamp joint for cement could stand 40 pounds pressure, which is equal to 100 pounds water pressure. The water acts as a cushion filling up the pores of the pipe and material. The pipe line was tapped in the depressions, and a ¾-inch pipe brought to the surface to draw off any condensation.

The high pressure line will be in operation from November 1st to March 1st, from sunset to 8 o'clock P.M., taking off the peak of the load in the heaviest season. The balance of the year this pipe line will be used on low pressure service.

The compressors are of the so-called "straight line" type made by the Rand Drill Co.; 12-inch steam cylinder, 16-inch air cylinder and 16-inch stroke. The steam cylinder is fitted with a Meyer cut-off, permitting more expansion of the steam in the cylinder than would be possible with an ordinary slide valve. It also permits the horse power developed at the steam end to be changed at will, thus permitting a wide range of pressures on the gas end without seriously interfering with the economy of the steam end.

The gas cylinder is fitted with the new Rand imperial valves, Corliss inlet and vertical poppet outlet, giving a high volumetric efficiency and permitting the cylinders by their position to be more thoroughly water jacketed than is usually possible.

Results of Tests on Compressor.

Boiler pressure	68 pounds.
Gas pressure	5 "
Indicated horse power, steam end	3.76
" " gas end	3.38
Mechanical efficiency of machine	90 per cent.
Total number feet compressed	31,924
Duration of test	2¾ hours.
Diameter of gas cylinder	16 inches.
" steam cylinder	12 "
Stroke	16 "

At the end of the high pressure line we located a low pressure regulator manufactured by the Chaplin-Fulton Company, Pittsburg, Pa. This was placed in a brick manhole with suitable cover. It regulates from 20 pounds to a few inches. The cross section of governor will give a good idea of its working parts.

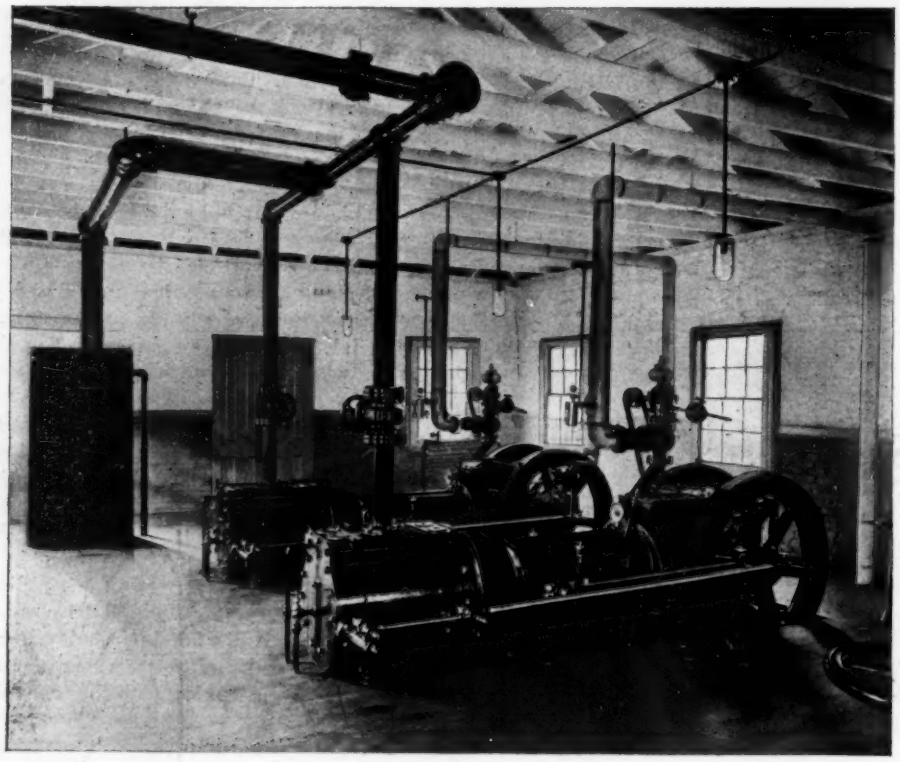
Results of Candle Power Determinations.

Holder Gas.	5 Lbs.	10 Lbs.	20 Lbs.	30 Lbs.	
16.14-candle power	....	15.73	....	....	Coal gas.
17.59 "	....	17.09	16.05	....	23 water gas.
18.56 "	....	....	15.48	15.02	22 per cent.
17.10 "	17.30	16.15	....	....	29 "
14.8 "	....	13.2	....	....	Coal gas.

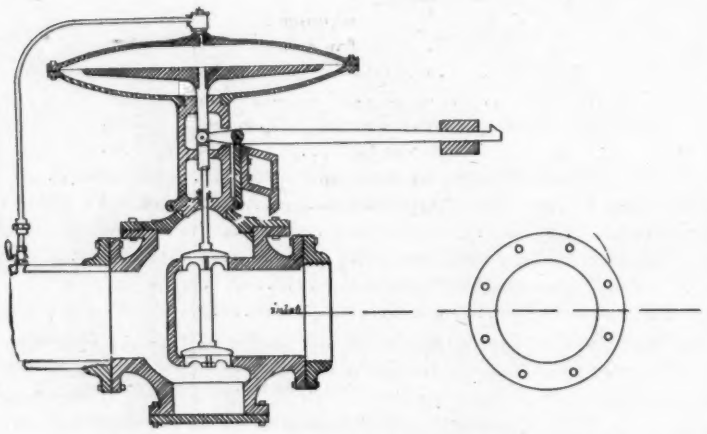
The candle power determinations were made on a bar photometer, set up 3 feet from the condenser. The temperature of the gas was 62°. The "F" size, new style Sugg's London Argand burner, having been found most suitable for coal, mixed and low candle power gas. The standard English sperm candles, 6 to a pound, were used as standard.

These Gas Analyses were made by J. F. Wing, Chemist, through the kindness of Mr. W. R. Addicks.

	Holder Gas.	Pounds Compression.		Holder Gas.	Pounds Compression.	
		10 lbs.	20 lbs.		20 lbs.	30 lbs.
	D.	C.	A.	E.	F.	B.
CO_2	2.5	2.3	2.4	2.0	2.0	2.1
Illuminants	6.0	6.0	7.0	6.7	6.5	6.7
O_2	0.2	0.0	0.0	0.0	0.0	0.0
CO	12.3	12.3	12.2	12.6	13.3	12.4
H_2	50.6	50.2	47.3	49.2	49.1	46.6
CH_4	26.4	26.7	25.0	28.0	27.1	27.6
N_2	2.1	2.0	5.7	1.5	2,5	4.7
Total	100.1	99.5	99.6	100.0	100.5	100.1
Candle Power.	17.6	18.1	16.06	18.59	15.48	15.02



The Compressors.



Low Pressure Regulator, Manufactured by the Chaplin-Fulton Mfg. Co.

The increased candle power and brilliancy at 5 pounds compression can be accounted for by the decrease of the moisture in the gas. Many attempts have been made to dry the gas with the result, that when it was deprived of its moisture the illuminating power was increased to a considerable extent. By actual tests it was shown that 65 per cent. of the moisture in the gas could be taken out at 10 pounds compression, and practically all the moisture at 20 pounds. Naphthaline is produced when there is a deposit of aqueous vapor, and gas deprived of aqueous vapor does not deposit naphthaline under ordinary conditions of temperature and pressure. There is no advantage gained to compress at a higher pressure that 6 pounds to overcome friction and remove moisture from the gas, thereby changing the color of the flame to a white light which is attractive to the public.

We pumped 18,200 feet per hour through 6-inch pipe 9,600 feet long, 10 pounds initial pressure, 9.28 terminal pressure = .72 pounds loss on line. Two minute pressure observations were taken at the same time for 1 hour.

Cox's high pressure computer is less than actual results but safe to rely upon.

Prof. S. W. Robinson, of Columbus, O., has kindly forwarded me the following formula, which is slightly in excess of the observed results:

V (cubic feet hour air pressure)—

$$= 48.4 \frac{T'}{\sqrt{T_1 T_0}} \sqrt{\frac{d^5}{L} (P_1 + P_2 + 30)(P_1 - P_2) \frac{0.6}{\text{sp. gr. gas}}}$$

Where T' = absolute temperature of storage = 461° + reading F° scale.

T_1 = absolute temperature flowing gas in pipe line reading F° scale.

T_0 = absolute temperature = 461° + 37° F = 498°.

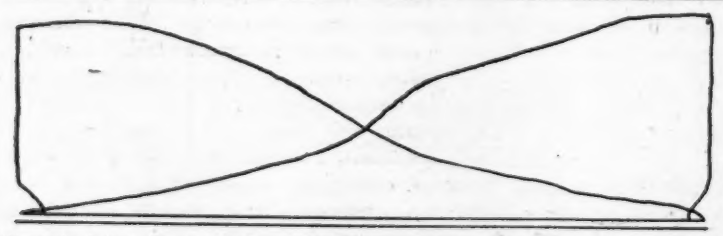
d = diameter in inches of pipe line.

L = length in miles of pipe line.

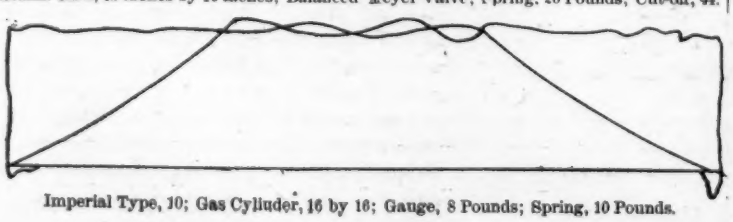
P_2 = apparent pressure at lower end of pipe line where gas is delivered; pounds per square inch.

P_1 = apparent pressure at upper end of pipe line, pounds per square inch.

Cubic Feet of Gas Compressed.	Compression Pounds.	Water Condensation oz.	Hydrocarbon oz.	Hydrocarbon Per Cent.	Hydrocarbon Beaume.	Hydrocarbon Sp. Gr.	Distillation of Hydrocarbon.							
							232°	246°	271°	282°	309°	318° to 331°	354° to 370°	Residue and Loss.
39,000	5	150	41.5	27	26.75°	.894	...	7.5	19.25	10	15.60	14.13	19.15	14.37
39,800	10	179	11.2	38½	28°	.886	6.5	16.3	17.4	0	16.9	13.9	20.8	8.2
38,200	20	280	19.9	41½	27.75°	.889	12	18	20.9	6	10	11.8	13.2	8.1



Steam Card, 12 inches by 16 inches; Balanced Meyer Valve; Spring, 20 Pounds; Cut-off, 44.



Imperial Type, 10; Gas Cylinder, 16 by 16; Gauge, 8 Pounds; Spring, 10 Pounds.

Discussion.

The President—Gentlemen, here is a paper that is overflowing with fresh material.

Mr. Allyn—I happened to be at Mr. Learned's works when the compressor was being erected, and I noticed that he was erecting in connection with it a condenser, which I understood was to reduce the temperature, which was increased by the action of the compressor. I think it might be interesting if Mr. Learned would give us a few facts respecting how much the temperature does increase, and under what given pressures?

Mr. W. A. Learned—Theoretically, without any water jacketing of the cylinders, at 5 pounds compression there would be a heat of 106°. At 20 pounds it would be 207°. The cylinders are all jacketed, and the gas passes very quickly into the water condenser, so that at the outlet of the water condenser the gas is about 60°. I have not made any tests on temperature between the machine and the outlet of the condenser.

Mr. Allyn—Are there any indications of naphthaline?

Mr. W. A. Learned—None whatever, even in the distillation of the hydrocarbons. In one sample we got simply a slight trace of naphthaline in the distillation tests.

The President—I tried to get the Danbury (Conn.) Company, which has the original high pressure installation, to send some data with respect to that, but the superintendent, who was unable to come to the meeting, said that the line was not arranged, so that many facts, other than the one that "IT WORKS," could be ascertained. "We pump direct from the holder," he says, "so have no measure of the quantity pumped. Having no photometer in Bethel, we do not know what difference, if any, there is in candle power." Mr. Coffin, what does your line at Schenectady carry?

Mr. Coffin (Schenectady, N. Y.)—It varies with their consuption. It goes as high as 4,600 and as low as 200. They use it day and night. On a test in one furnace they used 4,600 feet in 20 minutes.

The President—You delivered 4,600 feet in 20 minutes?

Mr. Coffin—Yes. The compressor is supposed to handle 14,000 feet an hour, which is what they expect to use.

The President—You have just reached the limit of the compressor, then?

Mr. Coffin—We opened up the compressor. Its full limit was 100 pounds more pressure. They opened up a big furnace at their end of the line and let it go, and we nearly burned down a building before we got word to stop it. We measure the gas at our end of the line through a 5-foot station meter on the inlet of the compressor. When we first connected it up we had it connected on the city main on the inlet, and that did not work. We now put it on the outlet of the 10-foot station meter. The 10-foot station meter will fluctuate about .3 of an inch; the 5-foot meter fluctuates about .6 or .7 of an inch. That is up as high as we have run it at the present time.

The President—When your main was delivering at the rate of 14,000 feet per hour what observation did you take on fall of pressure at the compressor and the consumption end of the line?

Mr. Coffin—Well, you see we carry 36 pounds at our end, and they have 15 ounces at their end.

The President—Is there a regulator interposed?

Mr. Coffin—At their end of the line, not at ours.

The President—You don't know what the pressure is on the far side of the regulator?

Mr. Coffin—Thirty-five pounds is what the compressor maintains at our end of the line. So far it has maintained that absolutely. At their end of the line it is 25 pounds, or 10 pounds less.

The President—When it is going at the rate of 14,000 feet an hour from a 4-inch pipe?

Mr. Coffin—It seems to stand at that all the time.

The President—Can you give us any information as to the oil condensed out?

Mr. Coffin—Nothing; no data at all.

The President—You have no interest in the candle power anyhow?

Mr. Coffin—No. They wanted the gas at that pressure. We only make one kind and let them have it. That has to suit them. That seems to work. That is all the information I have at the present time. It had only been running for 38 hours when I came away. So far it seems to work, and that is satisfactory to us.

Mr. Richardson—Is that cast or wrought iron pipe?

Mr. Coffin—It is a 4-inch, wrought iron pipe. It varies in depth from 5 feet under the railroads to 18 inches through the marsh.

Mr. Richardson—And its total length?

Mr. Coffin—Forty-three hundred feet from our end to their controller, and their pipe line is about 2 miles in their plant. They have about 2 miles of line in the General Electric Company's distributing system.

Mr. Richardson—On a low pressure?

Mr. Coffin—Yes.

Mr. C. A. Learned—I would like to ask the gentleman how he accounts for a 10-pound drop in pressure on a 4-inch line in 4,300 feet.

The President—I think the gentleman stated that the drop took place, no matter what they were sending.

Mr. Coffin—As far as we can get at it, that is the lowest. We have an ordinary steam gauge at our end of the line and an ordinary steam gauge is at their end. We have made no tests.

The President—You have not attempted to gauge it?

Mr. Coffin—No; we have made no tests at all on the line.

The President—If the gauges were shifted it would give a mean.

Mr. Coffin—We have not made any tests of any sort. We know the line is tight. We tried it when we put it in; tried it about 4 weeks ago, and the pressure stood without any drop at all for 2 hours. We know there is no leak in the line. Beyond that we have made no other tests at all. One of the gauges may be off; I cannot say anything about that.

The President—Do Mr. Learned's observations agree with your experience, Mr. Shelton?

Mr. Shelton—Mr. Learned's observations are of the utmost interest to me. I am very glad, indeed, to see that Mr. Learned has broken the ice in New England, and led in a way that I think will be greatly followed when the convenience and the results of distributing at high pressure are more fully realized. I think, too, Mr. Learned should be entitled to that credit; for, to my mind, the Danbury instance is scarcely a parallel case. The Danbury example, which was put in 10 or 12 years ago, if I recollect—perhaps more—was a 2-inch pipe line, not distributing direct and without holders, and depending only on regulators for accuracy of pressure, but simply to convey the gas, I think, 3 miles; not to a city, but to a hamlet in which there were 200 or 300 houses—a village, perhaps, is a fair statement—where the gas went into some stationary tanks and was fed out from those tanks into the town. Mr. Learned, as I understand it, is distributing primarily right from his initial works, using high pressures and no holders, but using controllers for cutting down the pressures at proper points; that is the fullness of the work of the high pressure system, to do away with any holders at the far end whatever. As you know, I have been identified with that work in the last couple of years, thinking it right in the line of increasing our efficiencies and decreasing our investments. The line that about a couple of years ago I put in at Phœnixville, Pa., has worked so smoothly since (and it is now in its third year) that we have almost forgotten its existence. Since that time there are 25 or 30 other lines that have been put in. In California there are 3 or 4. There is a line in Jersey, from Camden to Trenton, some 35 miles in length, of 12-inch pipe. Even our electrical friends in Schenectady, N. Y., are commencing to follow this line. So I think it is pretty good evidence that the system is all right, and that while it is not a cure for every evil of distribution, it is a splendid thing for certain conditions in the business. I was very much interested in following the paper, and agree in nearly everything that Mr. Learned has set forth and described. There are one or two questions I wish to ask him, and there is one thing upon which I take distinct issue. I am very glad indeed to find the first definite statements of candle power tests on such high pressure compressed gas. So far they have been entirely lacking. We have only been able to say in a general way that the compressing of the gas does not hurt it commercially; that there is not enough loss to be apparent at the other end or to amount to anything. I think that can still be said. It is nevertheless of interest to have some specific figures on the subject. The loss is a little greater than I had anticipated. One or 1½ candles for but 10 or 20 pounds compression is a little heavier than I thought the figures would show. It seems to me, however, that there is no reason to question the accuracy or the integrity of Mr. Learned's figures, of course, and we can only hope to have them supplemented by further tests on those lines, and by further tests on his lines, which will throw more light on it and bring out ultimately the absolute loss that is experienced, by compressing gas up to 20 or 30 pounds pressure, if it is more convenient to push it through a small pipe than on the old lines. I think it is interesting to note in the analyses table that there is no substantial effect, generally speaking, as far as the constituency of the gas is concerned. It seems to me the analyses after compression do not materially vary from the analyses before compression, to any commercial degree, at any rate. Now as to the pipe to be used. Suppose the city starts to put in one of its metropolitan sewers. Suppose there is a settlement of 100 yards or more in heavy rains in the spring, with parallel ditches open, and that sort of thing. I do not know that one is able adequately to protect a cast iron pipe against such contingencies, although he may mean to and try hard to. I believe that a pipe ought to be *wrought iron*, that can be flattened and twisted and sprung and hung and maltreated in almost every fashion, and yet will not fracture, so that the high pressure gas absolutely has the minimum chance of getting out. I believe that guarding against even that one condition or risk is enough of a question to make the wrought iron pipe preferable. I think I can say that, out of 20 or 25 high pressure pipe lines that are now operating or being built, Mr. Learned is the only one who has put in cast iron pipe. We differ on politics, we differ in various ways, and I, in a most friendly fashion, differ on this point with Mr. Learned. Most of the high pressure pipes so far have put after the compressing pumps a tank for a triple purpose. First, it absorbs the pulsation of the pump, like an air chamber on a water pump; secondly, it is a drip to condense and catch any liquor which is compressed out; thirdly, it serves as a condenser to cool the gas. These tanks may be merely any old boilers that one may

choose to put in the line of the pipe. I gather from Mr. Learned that he has improved on that practice and has put in a water condenser. I would like it very much if he would give the dimensions and capacity of that condenser for record in this discussion, so that the capacity that he has installed may be compared with the volume of gas that he is pumping or expecting to pump. I am especially interested for the reason that, while high pressure work is delightfully successful and serves many of our purposes, saving money and all that, we have yet had a few things to work out, to attend to, to look after, and one of them is a deposition of a drip or moisture out on the line. In two places where I am working on high pressure we get a good deal of oily water in the first 1,000 yards, perhaps 2,000 or 3,000 feet from the works. Beyond that it is perfectly dry; we never go near the drips. The line may be several miles long, but the first half mile captures every drop, until apparently the gas is partly cool. After it is cool we have no trouble. The gas goes out from the works hot; distinctly hot. The degree of temperature depends entirely upon how much we compress it, how fast we run the pumps, and, of course, how much gas is being handled and at what pressure. We have felt that if we completely cooled the gas at the works down to the ordinary distribution or earth temperature, we would not have a bit of trouble from drip in the first 2,000 or 3,000 feet, or yards, out on the line. I feel that as yet that point has not been worked out. The pumping of the gas is comparatively simple, as is the construction of a proper line. The use of individual house regulators along the line, the protection against accident, the safety provisions, the regulation at the far end by a district governor for turning into a set of low pressure mains, if you please, have all been, I think, almost standardized; at least, we scarcely give a second thought now as to what to do. We know what we want, and we simply go ahead and get the equipment. But the proper cooling of the gas after it has been compressed and before it goes out into the lines, so that all the condensation is gotten right at the works, has yet to be somewhat worked out and demonstrated and the apparatus necessary determined. Hence, for such reasons, I particularly hope that Mr. Learned will give us such information as he can concerning what provision he made for cooling his gas, and also whether he has found any condensation out on his line, in drips or otherwise, beyond his works. I would also like to ask what provision he made for measuring the gas. It is quite obvious that to measure the gas after compression is difficult. Proportional meters are a debatable proposition, to say the least—very good "guessing machines," as has been stated—dependable upon only if they are working on a uniform pressure. The pumps do not work at a uniform pressure, because the load varies and the speed of the compressing pump fluctuates according to the demand on the high pressure system. And so a proportional meter, in my experience, is "not worth a continental" for such purposes, and the only way to measure gas is on the inlet to the pump, as is done at Schenectady, and then to put the meter far enough away so that the suction of the pump and the vibration won't affect the drum or the water level. I forgot to do that in one instance, and put it about 8 feet away, and we shook the drum to pieces in about 8 weeks. That was one lesson learned. Mr. Learned makes the statement that there is no advantage gained by compressing at a higher pressure than 6 pounds to overcome friction and remove moisture from the gas. No doubt he means that in his particular town, with this sized pipe and his load, the 6 pounds serves all his purposes; but the inference might be drawn that there was no use of serving gas at high pressure beyond 5 or 6 pounds, which I think is a very mistaken idea, because if we compress to 5 pounds we might just as well compress to 25 pounds, and we can then use a very much smaller pipe than a 5 pound pressure would enable us, and save our investment to just that extent. If we can make a 4-inch pipe do the work of a 6-inch pipe, and still keep within the range of an ordinary or a few pounds pressure, there is *every* advantage in operating a 20 or 25 pounds pressure instead of a 5 or 6.

The President—Before you sit down, Mr. Shelton, will you tell us about the 12-inch Trenton main? Have you any knowledge of any loss of pressure at all comparable to this that occurred in Schenectady? The distance was 35 miles I think you said. Is that a wrought iron main?

Mr. Shelton—I was not connected with that work, Mr. President, and know very little about it. We only, in Philadelphia, got from the other side of the Delaware that the line had finally been laid, under the direction of some one from Pittsburg, I believe. There was no adequate provision made for expansion, in the way of proper joints at proper intervals. Shortly after being laid it pulled apart, and it was then restored, and I believe it is now again in use. It is a 12-inch main of wrought iron. It runs from Camden to Trenton, and feeds Burlington and Riverton and a number of incidental towns in the 35-mile stretch.

The President—Do you know what the initial pressure is?

Mr. Shelton—It is a magnificent undertaking, and the largest high pressure artificial gas pumping plant in this country so far, big enough for two cities 35 miles apart, with 70,000 or 80,000 population, with all the population between them that is tributary. I do not know what the initial pressure is. They only started a few weeks ago, and have been in an unsettled preliminary operating state. It is hardly fair to judge of what they may be doing yet. They may have a few troubles in starting off, but it will only be a matter of a few months or a few weeks to strike their gait and have the line, I am certain, work with great satisfaction thereafter.

The President—Does your experience approve of pumping coal gas and water gas and mixed gas with equal satisfaction under high pressure?

Mr. Shelton—I would not hesitate, Mr. President, to pump any kind of gas that I might happen to be making. I have so far only pumped water gas in my own line.

The President—Do you know at what temperature that leaves the compressor? You spoke of its being hot; but how hot?

Mr. Shelton—It has varied in different cases, sir, as Mr. Learned says, from 100° to 200°.

The President—Do you reach 200°?

Mr. Shelton—According to how hard we work the compressor.

The President—And do you consider that the steel mains that we ordinarily lay would with this pressure be as durable as wrought iron?

Mr. Shelton—My feeling thereon is that I would put in a wrought iron main and tar it or coat it with some of the several preparations. I am now working on the idea, which I hope to perfect, of incasing the main with cement ¼ or ⅜ or ½-inch thick by a mechanical process which will avoid the expense of handling. Of course, if a wrought iron pipe that had to be laid in the ground had to be cemented with a trowel, it would be so expensive that it would be prohibitive; but I think that if the cement could be mechanically put on it would be a splendid safeguard against electrolysis and corrosion of the pipe. For instance, you can see yourself that if a service pipe were laid in a trough, or two boards put together, and then liquid cement run in and the service pipe be embedded, its life would be almost indefinite. I do not see why a wrought iron main of small diameter, say 6 or 8 or 10 inches, might not be covered by a movable shell, which could be clamped around the pipe, and liquid cement be run in through a funnel on the top from a portable wagon or tank on wheels along the trench, with a couple of men constantly keeping a uniform mixture of cement in the wagon, by a hose to lead the cement to the spout; 100 yards might be run at once in coating the pipe, and then the equipment moved down the ditch and the next 100 yards coated, thus making the cost of labor a very small item. I believe that then you would get the elasticity of wrought iron pipe and great durability and freedom from electrolysis, and I am endeavoring to shape out a method of so coating pipe on those lines. I have no desire to keep it to myself. I would like to see such a scheme perfected by someone, so that we could all use it, and eliminate this question practically of the durability of wrought iron pipe and get a crack at electrolysis at the same time! I hope someone will take up the thought that I have suggested and see if he cannot work it out too. Under those conditions, and under present conditions I would use a steel pipe, or a wrought pipe, whenever I was able to buy the cheapest.

The Secretary—This question I would like to ask Mr. Shelton. He referred to the Trenton line. My question is as to what pressure was carried on that large line. I think that is the largest line that has been set up, is it not?

Mr. Shelton—I don't recollect, sir. I have never happened to learn, but I imagine it is 20 or 30 pounds. If Mr. Frank Moses happens to be in the room—he was connected with the Trenton Company, although he is not at present—he may possibly know more about it.

Mr. Africa—I would like to ask Mr. Shelton about the difference in the expansion between the iron pipe and the cement. If a long line of pipe be covered with cement, is the expansion so nearly the same that the cement covering would not crack? One of the advantages claimed for wrought iron pipe over that of cast iron, for high pressure mains, is that it is more flexible; that is, it will better stand any settling or heaving of the soil; but if we cover wrought iron pipe with a coating of cement we make it a rigid pipe, so that, if from any cause, the pipe were bent, the cement would crack and we would then have an unprotected pipe. This would be the point at which we would most likely have trouble.

Mr. Shelton—I think Mr. Africa is misinformed. It is my impres-

sion that the co-efficient of expansion of cement and iron is almost identical, and that that is a particular reason why they would bond excellently and expand or contract uniformly. I had occasion to look into that in the construction of cement purifiers, when expanded metal was used to bond the cement of the side walls of the boxes. I know that the expanded metal interests make the flat assertion that two great reasons for the success of using expanded metal so extensively in concrete work is: First, the fact of the *adhesion* of the cement to the metal; and, second, the fact that the *co-efficients of expansion are substantially the same.*

The President—Mr. Gould, will you please state the experience with cement and what the co-efficient of expansion is?

Mr. Gould—My experience is that the expansion of cement and iron are practically the same.

The President—Don't you think it makes a great difference as to whether the cement is thoroughly set or not before you begin to calculate the co-efficient of expansion?

Mr. Gould—I should say, if cement was properly set, it was about the same. The expansion of cement and iron is more uniform than lead and iron, and this is one reason why it makes a better joint than lead in a gas main.

The President—Has any other member any further question to ask Mr. Shelton?

Mr. J. J. Humphreys, Jr.—Will Mr. Shelton or Mr. Moses describe the form of joint that failed at Trenton, and whether it failed at the joint or somewhere else in the line when the expansion strain came on it?

Mr. Shelton—The failure in the Trenton line was merely an incident of starting off. I don't think it is anything against it, any more than that they did not sufficiently protect the valves and fittings by expansion joints, such as the Dresser, which is so suitable and worthy that it is entitled to direct mention in such connection. I feel that if they had put a Dresser joint, for instance, close to each valve or fitting, that they would have been protected from undue strain. As a matter of fact, I am told that a 12-inch valve pulled apart absolutely; that the pull of the line was such that the flange was pulled off the body of the valve 1½ or 2 inches.

Mr. W. A. Learned—In regard to the condensation outside of the works, our first drip is 1,400 feet away. We have been running since December, and day before yesterday we took out 14 gallons. We tried the rest of the drips along the line and found nothing. The condenser is 11 feet high, 3 feet diameter of shell, with 42 3-inch tubes, 8 feet long. The gas passes around the tubes.

The President—Isn't there a very precipitous rise directly at the works on this main, which is very favorable to retaining the condensation at the compressor?

Mr. W. A. Learned—Yes; and it acts as a first class condenser. The condenser was made by the Western Gas Works Construction Company, and I told them to figure the sizes, etc., on what their experience had been. I have a feeling that if it was absolutely essential to collect all of the condensation at the works the condenser would have to be larger, but really that first 1,000 feet of pipe in the ground is a most excellent condenser, and in some cases if you had a long line of pipe dripping back to the works I should not spend very much money on a water condenser. I must confess that this did not cost me very much. You might get along even with an ordinary air condenser or an old boiler. I used cast iron pipe on account of cheapness at that size. I think a 3 or 4-inch wrought iron pipe will take precedence, so far as cheapness is concerned, but would not recommend cast iron for those sizes. There is a great deal of flexibility to those joints, as you will perceive when I tell you that the line was made up on the top of the trench and then lowered. The deflection is about 8° or 9° upon each joint. We are troubled with electrolysis, and put this pipe line in a very trying position. It was for that reason that we adopted cast iron, because of its durability, cheapness and ability to get a perfectly insulated joint, which no doubt we have. The gas is measured from the station meter and also from a small holder. The gas is made into this holder from the works, and that is our only method of measuring it. That is checked up by a counter on the apparatus itself. Speaking about the factors of expansion as between cement and iron, as has been stated they are about equal. It was for that reason that we built a large 700,000-foot holder with a cement bottom and wrought iron sides.

Mr. Richardson—Mr. President, I think no other subject could be more interesting or of more value than this. It certainly could not have been presented in a clearer, more concise or more interesting way. I have been at the works in Newton, and surely the details have been portrayed very clearly, very truthfully. I went first to see it, because we are installing 12 miles of the high pressure in North Adams, 6 to Williamstown and 6 to Adams. This is a question that will be bound to interest many people from this time on. This is a very valuable paper, exceedingly so, and it will be a paper that can be read with interest and profit when it is published, even re-read. I want the pleasure of proposing a special vote of thanks to Mr. Learned for this paper, and also to Mr. Shelton for his timely discussion upon that subject. [Seconded by Mr. Africa and adopted.]

Mr. Allyn—Before the discussion is closed I would like to inquire of Col. Richardson whether he is intending to use or is using wrought or cast iron pipe in his high pressure system?

Mr. Richardson—We are using 6 miles in two different directions, or 12 miles in all; a 3-inch on the line to Williamstown and 4-inch on the line to Adams, the smaller place not requiring as large a capacity. They will be taken to the small works in the two places, and turned into the low pressure distribution without use of the holders; it will be simply the use of a governor. We planned to have duplicate compressors with exactly the same connections as shown in the paper of Mr. Learned's, but each compressor with a sufficient capacity to feed both ways through one outlet, a 6-inch pipe; the 3-inch pipe going one way and the 4 the other. Both lines are of wrought iron.

The President—I had the pleasure of seeing the main in Newton when the work was being finished, and the conditions are such that I think Mr. Learned will continue to get thoroughly satisfactory service out of it. He has definitely settled in his own mind, I deduce from his paper, that he is going to carry not in excess of 5 or 10 pounds pressure. That is a very important point settled at this stage of his experience. I think that his service will be very satisfactory. The members are invited to visit this afternoon, if they are interested in the matter, the factory of the National Bread Company, of New England, 54 Chardon street, Boston. Two gas heated ovens are there installed, each having a capacity of about 800 loaves of bread per hour. There are also installed two gas engines, direct-connected to electrical generators which furnish all the light and power used in the building. A point of interest in this engine plant is the use of the hot water from the jackets of the engines to heat a room in the building and supply all the hot water consumed in it. The ovens are believed to be the largest as yet built in this country. As the question of gas engines seems to be one of growing interest all the time, I am glad to be able to mention also that the National Meter Company has in operation at its store, 159 Franklin street, a 20-horse power direct-connected Nash gas engine for lighting purposes, and it will be pleased to show the plant to any members who are interested in the extension of the use of gas for power and lighting in this way.

Acknowledging Letters of Regret.

The Secretary is in receipt of a large number of letters from friends and members of the Association, including Mr. A. S. Miller, President of the American Gas Light Association, Dr. Schniewind, Mr. Snow, who by the way states that he thinks he will be able to contribute a full set of proceedings of the Holyoke Commission to the library, Mr. E. C. Jones, of California, Mr. Alex. C. Humphreys, President of Stevens Institute of Technology, Mr. Pritchett, President of the Massachusetts Institute of Technology, Mr. E. G. Pratt, Mr. W. R. Beal, and a great many others. Is there any other business to come before the meeting?

The Secretary—Mr. President, if you will kindly sit down and allow me to address the First Vice-President and the members of the Association for a moment, I would like to call attention to four very valuable papers which have appeared before this meeting of the Association, three of which have no name attached. One of them you have heard read by the President. Naturally you can guess at its authorship. The list of members, which you have all had copies of, was also prepared by the President. The list of papers which have been read before this Association during its entire existence, arranged both chronologically and by topics, has also been prepared by your President. The other publication, in regard to the library fund, comes from the same source. I merely mention that as an instance of the persistent industry which you all know belongs to this gentleman, and to call your attention to this exhibition. It would be useless for me to enlarge further upon his services to the Association. I personally am glad, as you have done me the honor to continue me in this position for another year, that you have allowed me to be associated with Mr. McKay for another year, of course, having the further delight to look forward to be associated with the other gentlemen in years to come.

Mr. Fowler—Mr. First Vice-President, we wish very much to express our thanks to our present President and to the Secretary for the

efficient manner in which they have performed the work of the year and conducted the business of the present meeting.

The President—Gentlemen, it is very pleasant to have this statement made, however incomplete the veracity may be. The Secretary has been as modest in avoiding mention of his own work as he has been generous in speaking of the work of others. Is there any other business? If not, a motion to adjourn will be in order.

On motion of Mr. Allyn the meeting was declared adjourned.

[Official Report.—Revised by the Secretary.]

NINETEENTH ANNUAL MEETING, OHIO GAS LIGHT ASSOCIATION.

Held in the Grand Hotel, Cincinnati, O., March 18, 19 and 20, 1903.

First Day—Morning Session.

The Ohio Gas Light Association convened in Nineteenth annual meeting, at the convention hall, Grand Hotel, Cincinnati, O., March 18, 1903, at 9:30 A.M., with Mr. Charles Woodward Andrews, of Hamilton, O., as President, and Mr. T. C. Jones, of Delaware, O., as Secretary and Treasurer.

ROLL CALL.

Upon call of the roll the following members reported their attendance:

Abbott, E. D.
Alcott, F. L.
Allen, G. A.
Andrews, C. W.
Barbour, W. T.
Barnard, F. F.
Barnes, G. W.
Barthold, W. H.
Baxter, I. C.
Beckwith, J. W.
Bender, W. E.
Blinn, A. C.
Blower, F. W.
Boal, S.
Boyle, W. C.
Bredel, F.
Buck, E. H.
Butterworth, I.
Canterbury, J. P.
Carpenter, H. A.
Cavenagh F.
Clausen, W. F.
Clapp, G. N.
Cline, J. W. R.
Cobb, B. C.
Connelly, J. S.
Coombs, M.
Combs, F. S.
Corbus, F. G.
Cressler, A. D.
Critchfield, C. V.
Critchlow, E. C.
Daugherty, G.
Davidson, J.
DeArmon, C. W.
Dell, J.
Dickey, E. S.
Doherty, H. L.
Dolph, A. M.
Douglas, H. W.
Droulliard, G. L.
Eaton, A. B.
Elles, E. J.
Eysenbach, E. E.
Fuertado, R. S.
Field, F. H.
Foster, B. P.
Franklin, H. G.
Franklin, J.
Gardner, W. H.
Garrison, F. L.
Gassett, A. L.
George, W. B.
Gillaspie, J.
Gray, A. R.
Gregory, J. M.
Guldlin, O. N.
Gwynn, J. W.
Hamlinck, L. C.
Hanley, E. W.
Harper, H. D.
Harris, J. A.
Harrop, H. B.
Hayward, S. F.
Hedges, J. S.
Henry, W. G.
Hesser, C. F.
Hess, F. H.
Hickenlooper, A.
Holmes, A. G.
Humphrey, A. H.
Humphreys, E. C.
Johnston, E. D.
Jones, H.
Jones, T. C.
Kahn, L.
Kellum, B.
Kenan, N. G.
Knight, J. J.
Knight, W. H.
LaKemp, H. J.
Landon, H. M.
Langwirth, F. A.
Lea, H. I.
Leakey, N. G.
Light, J.
Lindsay, C. R.
Lloyd, E. F.
Low, D. W.
Lynn, J. T.
McCormick, E. T.
McDonald, D.
Louisville, Ky.
McDonald, D.
Albany, N. Y.
McElroy, B. L.
McIlhenny, J. D.
McMillan, J.
Malone, M. E.
Mancourt, E. M.
Mansur, J. M.
Many, F. B.
Marks, W. D.
Mason, C. T.
Mason, J. T.
Megie, B. F.
Miller, W. A.
Milne, D. S.
Moon, O. P.
Morreau, A.
Moses, F. D.
Mulholland, S. E.
Mullen, J. J.
Neley, J. D. S.
Olds, H. L.
Palmer, L. T.
Pattrell, C. B.
Perkins, B. W.
Perry, A. T.
Persons, F. R.
Phillipp, E. B.
Powell, W. R.
Printz, E.
Price, W. W.
Ritter, C. S.
Roper, G. D.
Rothstein, B. F.
Russell, D. R.
Schniewind, F.
Schwarm, C. A.
Seamon, J. F.
Sears, C. W.
Scroll, H. D.
Shacklette, R.
Sharp, W. G.
Shelton, F. H.
Stacey, A. J.
Stacey, F. A.
Stacey, J. E.
Steinwedell, W. E.
Steele, G. P.
Steenbergen, C. L.
Stevens, J. G.
Steward, R. B.
Strain, G. A.
Stone, F. W.
Trenkamp, H. J.
Tuttle, S. M.
Van Wie, E. G.
Walters, J.
Warren, E. C.
Wells, L. W.
Wendler, B. F.
Whysall, G.
Wickham, L.
Witherden, G. M.
Wones, W. R.
Wordell, H. H.
York, G. W.

The President in opening the proceedings said:

Gentlemen: The nineteenth annual meeting of the Ohio Gas Light Association will please come to order. It gives me great pleasure to introduce to you the Honorable Julius Fleischman, Mayor of Cincinnati, who will welcome us to the Queen City. [Applause.]

The Hon. Julius Fleischman then delivered the following

Address of Welcome.

Mr. President and Members of the Ohio Gas Light Association: It is a very difficult matter just at the present time for me not to address an assemblage such as this as "Fellow Republicans." [Laughter.] I hope there may be a few of them here to-day. It might be excusable on my part if I did not know exactly what I was saying at this hour of the morning, because last night I first attended a banquet by the Friendly Sons of St Patrick, and later in the evening (or morning) I attended another affair under the auspices of the United Irish Society. [Renewed laughter.] That accounts for my being a little late. In the first place, let me say that during my incumbency as Mayor of this city, extending over a period of three years, in welcoming similar gatherings this is the first one I have been called upon to address which has been called to order on time. I suppose, however, that all gas people are prompt. At least I understand that our Gas Company is always prompt in sending in its bills. [Prolonged laughter.] A good many people have tried to tell me why you came to Cincinnati and why you meet annually in this way. One man who was connected with our local Gas Company told me last night that it was in order to devise ways and means to get the best of the unsuspecting public. [More laughter.] Seriously speaking, however, I know that you have gotten together for the purpose of learning from one another different methods of details connected with your business and to improve your opportunities and technical knowledge; but why you have come to Cincinnati we do not exactly know. Cincinnati is getting out of the way of gas. But we still are getting a good deal of gas from some of the members of our local Company. [Renewed laughter.] I simply want to tell you, gentlemen, in welcoming you to Cincinnati, that we have a real nice city, and we heartily welcome such organizations as this, because we like to show what we have. The people of Cincinnati are never so happy as when they are welcomtheir friends from throughout the State of Ohio to their gates. We want you to make the best of your visit here. We want you to benefit by your discussions and by what you may observe in your brief stay in our city. When you are through with your business we know that you will be well taken care of, and that the local committee will show you what we have in Cincinnati, and we know that they will succeed in giving you a very pleasant time indeed. All we want of you in return is that when you go to your respective homes you say a good word for Cincinnati. And we hope that your experiences here this time will create the desire on your part to come here soon again. I thank you. [Applause.]

The President then introduced Mr. John D. McIlhenny, of Philadelphia, Pa., who delivered the following

Response.

Mr. Chairman, your Honor, the Mayor, and Members of the Ohio Gas Light Association: It is quite an honor to respond to the very felicitous speech of the Honorable Mayor of Cincinnati, and I think we have all been much interested in his words of welcome. Observing his Honor to be such a young man, I am sure he will pardon the statement that this appears to be a country of young men. I met a man from Louisville, Ky., a few years ago, a man of about middle age, who told this story in connection with the young men of the West. He went to New York to promote a business enterprise involving the loaning of money on merchandise held in a storage warehouse, or, in other words, in bond. He went to the President of the Chemical National Bank, the leading bank of that day, and one of the leading banks of to-day for that matter, and stated what he wished done. After he was through, the President of the Bank said to him, "That is all right; that sounds all very well; but you people out there are too young." Our friend from Kentucky replied, "Just give us a little time and we will outgrow that." (Laughter and applause.) The Middle-West has outgrown it. People all over the country, east, west, north and south, know that the people of the Middle-West are a little force in this country. We know that out of Ohio has proceeded many successful enterprises, among which I include the Ohio Gas Light Association. Many politicians holding public office, both in Ohio and throughout the country, have hailed from the Buckeye State. They have reflected credit upon their own State as well as upon the country. Ohio is a great State. We all know that. We all know that Cincinnati is a lively, enterprising and prosperous city. We know it is not very far from the center, geographically, of the population of the United States, and its fame is well known. One thing has interested me within the last day. I came here yesterday morning, and since that time I noticed that the people of Cincinnati appear to be carrying out the Roman derivation of the name of their city. We see many Latin mottoes about Cincinnati. For instance, this hotel on its letter head has a Latin quotation. Yesterday I visited the

Franklin Gas Appliance Exchange, adjacent to the office of the Cincinnati Gas and Electric Company, or the Cincinnati Gas and Electric Company's office is adjacent to that of the Exchange, I do not know which; and there a large Latin motto was displayed over an enormous reflector. I trust that all of these mottoes have an appropriate meaning. That reminds me that a few years ago I bought a straw hat in the summer time and after having taken it away from the hatter's I looked in the crown of it as we often do, and saw there a Latin motto which, translated into English, meant, "Nothing under the hat." (Laughter.) I hope the Latin mottoes and maxims displayed in this city are equally as appropriate. (Continued laughter.) Mr. Mayor, on behalf of the Ohio Gas Light Association we thank you for your cordial welcome to the Queen City. We always feel at home in Cincinnati, and after your cordial welcome I can only say that we now feel doubly so. (Applause.)

The Mayor—Gentlemen, just one word I desire to add. I have learned something since I sat down which was unknown to me before, and that is that I am not only welcoming men here from the State of Ohio, but from all over the United States. While, as I said before, we are always happy to receive men from the State of Ohio within the gates of our city, when they come from a greater distance and from other States they are doubly welcome. Everybody in the State of Ohio realizes, with the exception of one city in the State, that Cincinnati is the best city in the State of Ohio, and we want people who come from afar to learn that fact for themselves, so they can go home and tell their friends about it. I am very much obliged indeed for your thanks, and I assure you that what I said in welcoming you here was entirely sincere, and I trust you believe me, and after I leave the room and the doors are closed in executive session, I hope you will not whisper to one another that I have lied like the proverbial gas meter. (More laughter and applause.)

The President—I am sure we all appreciate very highly this cordial welcome which we have received from the Mayor, and that we will all take pleasure in carrying out his suggestion when we go home by telling our friends what a hospitable city Cincinnati is. The next order of business is the reading of the minutes of the last annual meeting.

On motion of Mr. Butterworth, seconded by Fred. R. Persons, it was ordered that the reading of the minutes of the last annual meeting be dispensed with.

Report of Executive Committee.

The report of the Executive Committee was then read by the Secretary.

To the members of the Ohio Gas Light Association: Gentlemen—Your Executive Committee begs leave to submit for your consideration the following recommendations and report:

1. That H. L. Doherty, Moses Coombs and W. B. George be appointed a Nominating Committee.

2. That Jno. D. McIlhenny, J. W. R. Cline and R. Shacklette be appointed a Committee on Memorials.

3 That Geo. Whysall, F. W. Stone and J. G. Stevens be appointed a Committee on Next Place of Meeting.

4. That F. K. Pelton, C. S. Lomax, H. G. Thompson, J. F. Stuckenborg, C. T. Scoville, C. M. Gunther, J. H. Harbine, C. M. McLain, F. K. Wells, J. Henry La Kamp, John Mills, Geo. Matt and John Walters be released from membership at their own request.

5. That Geo. E. Crisp and F. A. Wilke will be dropped from membership for non-payment of dues.

6. That the following be elected to active membership:

William A. Baehr, Superintendent Gas Department, the Denver (Col.) Gas and Electric Company.

F. F. Barnard, Superintendent, Wilmington (O.) Gas Light and Coke Company.

W. H. Barthold, Superintendent of Manufacture, Grand Rapids (Mich.) Gas Light Company.

Frank W. Blower, Secretary and General Manager, Kalamazoo (Mich.) Gas Company.

Earle H. Buck, Manager, Citizens Gas Light Company, Vincennes, Ind.

Frank Cavanagh, Manager, the Consumers Gas Stove and Fixture Company, Cleveland, O.

B. C. Cobb, General Manager, Saginaw City (Mich.) Gas Company.

E. S. Dickey, Treasurer, Maryland Meter Company, Baltimore, Md.

A. M. Dolph, President and Treasurer, Paris Gas Company, Cincinnati, O.

E. S. Ellis, Superintendent Gas Department, Evansville, Ind.

R. S. Fuertado, General Superintendent, Western Gas and Investment Company, Chicago, Ills.

H. G. Franklin, Superintendent Public Lighting, Cincinnati Gas and Electric Company, Norwood, O.

Joseph Gillespie, Superintendent, Washington Gas and Electric Company, Washington, Court House, O.

A. Ross Gray, Traveling Salesman, S. R. Dresser, Bradford, Pa.

H. B. Harrop, Chemist, Milwaukee (Wis.) Gas Light Company.

W. G. Henry, Vice-President, Detroit Stove Works, Chicago.

C. F. Hesser, Superintendent Promotion Department, the Cincinnati (O.) Gas and Electric Company.

A. H. Humphrey, President, General Gas Light Company, Kalamazoo, Mich.

Benj. J. Kellum, Manager, Welsbach Company, Chicago.

J. J. Knight, Vice-President, Kalamazoo (Mich.) Gas Company.

Henry I. Lea, Assistant Engineer, Western Gas Construction Company, Fort Wayne, Ind.

Chas. R. Lindsay, Lindsay & Company, Chicago.

Benj. F. Megie, Manager, Welsbach Company, Cincinnati, O.

John J. Mullen, Salesman, the Schneider and Trenkamp Company, Cleveland, O.

L. T. Palmer, Secretary and General Manager, Niagara Light, Heat and Power Company, Tonawanda, N. Y.

Wm. R. Powell, Secretary and Treasurer, Columbus (O.) Gas Company.

C. W. Sears, Assistant Superintendent, Delaware (O.) Gas Company.

H. D. Scroll, Salesman, Detroit Stove Works, Chicago.

R. Shacklette, Cashier, Adrian (Mich.) Gas Company.

W. E. Steinwedell, Secretary, the Gas Machinery Company, Cleveland, O.

Scott, M. Tuttle, Inspector, Springfield (O.) Gas Company.

H. H. Wordell, Salesman, Welsbach Company, Cincinnati, O.

Respectfully submitted for the Executive Committee,

CINCINNATI, O., March 18th, 1903. T. C. JONES, Sec.

The President—Gentlemen, you have heard read the report of the Executive Committee. What is your pleasure?

On motion of Mr. J. W. R. Cline, duly seconded and carried, the report was adopted and ordered spread upon the minutes of the Association.

Election of New Members.

It was then moved by Mr. Irvin Butterworth, duly seconded and carried, that the Secretary cast the ballot of the Association for the election to membership in the Association of the applicants recommended by the Executive Committee.

The Secretary—Mr. President and Gentlemen: In complying with your motion, it gives me pleasure to cast the ballot of the Association for the election to membership of the applicants referred to. I hereby so cast the ballot of the Association and declare them duly elected members of the Ohio Gas Light Association.

Welcoming the New Members.

The President—It is the desire of the Chair, and I am sure that it is also the desire of the other members present, that the gentlemen whose applications have just been favorably acted upon, and who are now members of the Ohio Gas Light Association, will feel free to take an active part in these proceedings, and we would be glad to hear from them in the discussions which are to follow. The next report in order is the report of the Secretary and Treasurer.

Reports of Secretary and Treasurer.

Mr. T. C. Jones, as Secretary and Treasurer, submitted the following reports:

To the Members of the Ohio Gas Light Association: I have the honor to present herewith the 19th Annual Report of the Secretary and Treasurer for the period between March 19, 1902, and March 18, 1903:

New members admitted at the 18th annual meeting	14
Released from membership	12
Deaths	2
Active members this date	225
Honorary members this date	13

Financial Report.

Receipts.

Balance from last year	$470.29
Received from dues	609.00
Received from initiations	65.00
Received from gas journals for report of 18th annual meeting	174.80
Received from sale of half-tones and etchings	21.30
Total	$1,331.39

Expenditures.

Printing and stationery	$268.38
Postage	30.25
Expense reporting 18th annual meeting	174.80
Secretary's salary	300.00
Expense of executive committee	20.85
Telegrams and telephones	12.44
Express	3.22
Badges	11.60
Balance on hand, as per certified check	509.85
Total	$1,331.39

Respectfully submitted,
T. C. JONES, Secretary and Treasurer.

Approved: JOHN FRANKLIN, F. W. STONE, } Finance Committee.

It was then duly moved, seconded and carried that the report of the Secretary and Treasurer be received, adopted and ordered spread upon the minutes of the Association.

SOME LETTERS AND TELEGRAMS.

The Secretary—Gentlemen, we have a number of letters and telegrams of regret, a few of which I will read, and the rest I will simply refer to by name. The following is from the Secretary of the Western Gas Association:

NEW ALBANY, IND., March 19, 1903.

Mr. T. C. Jones, Secretary the Ohio Gas Light Association, Cincinnati, O.—Dear Sir: I had entertained hopes until to-day of being able to attend the 19th annual meeting of the Ohio Gas Light Association, but duties prevent my leaving home.

Wishing you a successful and enjoyable meeting, and inviting the members of the Ohio Association to attend the next meeting of the Western, at Indianapolis, May 20-21-22.

Yours very truly, JAMES W. DUNBAR, Secretary.

Also the following from the Secretary of the Pacific Coast Gas Association:

SAN FRANCISCO, March 10, 1903.

Mr. T. C. Jones, Secretary the Ohio Gas Light Association, Cincinnati, O.—Dear Sir: I regret exceedingly that circumstances make it impossible for me to be present at the 19th annual meeting of the Ohio Gas Light Association. The Pacific Coast Gas Association sends you its most hearty wishes for a successful and instructive meeting.

Very cordially yours, J. B. GRIMWOOD, Secretary.

From ex-Governor Bushnell I read the following:

SPRINGFIELD, O., Feb. 28, 1903.

Thomas C. Jones, Secretary Ohio Gas Light Association, Delaware, O. My Dear Mr. Jones: I am this morning in receipt of your invitation to attend the 19th annual meeting of the Ohio Gas Light Association, March 18th-20th, at the Grand Hotel, Cincinnati. I assure you it would give me pleasure to attend, but I expect to be absent from the State on those days. I am contemplating a trip to Florida and Cuba during the month of March, and shall, therefore, be deprived the pleasure of joining my fellow members of the Association on that occasion.

Hoping the meeting will be a most enjoyable and successful one in every respect, I beg to remain, with cordial regards,

Very truly yours, ASA S. BUSHNELL.

Gen. John P. Harbison, President of the Hartford City (Conn.) Gas Light Company, telegraphs: "Congratulations and best wishes for successful meeting. Regret I cannot come."

Similar communications were received from the following gentlemen: Walton Clark, of Philadelphia; Alexander C. Humphreys, of New York city; Moses M. Granger, of Zanesville, O.; A. P. Lathrop, of St. Paul, Minn.; Paul Doty, of Detroit, Mich.; George G. Ramsdell, of New York city; Walter R. Addicks, of New York city; Alten S. Miller, of Baltimore, Md.; M. B. Daly, of Cleveland, O.

Mr. F. H. Shelton, of Philadelphia, telegraphs: "Best wishes for the best meeting yet held by the Ohio Association. Will join you Thursday morning."

The President—Gentlemen, I believe there are no special committees to report at this time. The next order of business is the address of your President.

Vice-President McIlhenny then assumed the Chair and President Andrews delivered the

ANNUAL ADDRESS.

[For the text of President Andrews' Address, see JOURNAL, March 23, page 449.]

COMMITTEE ON PRESIDENT'S ADDRESS.

The Vice-President—Gentlemen, you have heard the address of the President. It is customary, I believe, that it be referred to a committee of three.

It was then moved by Mr. Hayward, duly seconded and carried, that the address of the President be referred to a committee of three to be appointed by the Vice-President. The Vice-President appointed as such committee, Messrs. James T. Lynn, Detroit, Mich.; Irvin Butterworth, Denver, Col.; B. W. Perkins, South Bend, Ind.

[To be Continued.]

[Prepared for the JOURNAL.]

The Simmance-Abady Photometer.

The construction of this instrument, for comparing two lights of the same or different colors and so facilitating the estimation of the intensity of one in terms of the other, is based on principles which are generally admitted to be well founded. The researches of Rood, Ferry and Whitman, from 1892 to 1896, on the subject of retinal sensitiveness to varying luminosities, more especially in respect to the retentiveness or duration of the impression of luminosities of different tints, prove conclusively that intensity is the sole arbiter of the length of such impressions, and that color has no influence in the matter, which conclusion has been confirmed by recent experiments of Messrs. Simmance and Abady.

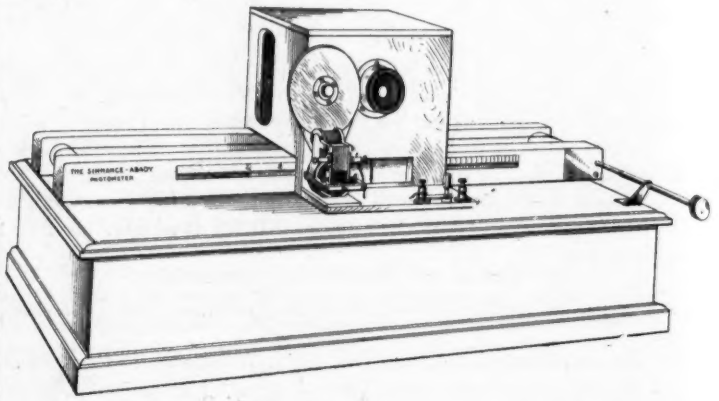


Fig. 1.

This being granted, it is obvious that a photometer which, taking advantage of this phenomenon, bars out all differences of color and only registers intensities, will at least tend to abolish the uncertainties which have accompanied tests of various tints of light.

It is found that if rays from two sources of light, one being, for example, red, the other green, are allowed to fall in rapid succession upon a screen or upon the retina, the eye ceases to distinguish the colors, and is only sensible to the degree of intensity of the illumination. The utilization of this fact gives us the photometer required, for if the intensities of the two lights (red and green) are equal, no difference in the illumination is perceptible (the eye losing all sense of the colors), whereas if the intensities differ, the eye is acutely sensible of the fact.

The Simmance-Abady photometer is a simple means of carrying into practice the above theory. Beams from each light (one being of a known power and the other unknown) are directed on a paper screen

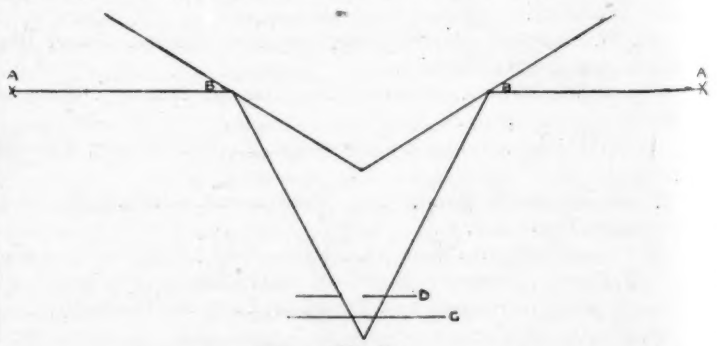


Fig. 2.

A A are the lights; *B B* the reflecting surfaces; *C* is the illuminating screen, and *D* the vibrating shutter.

across which vibrates a shutter, cutting off each ray in turn. Thus the eye perceives only one ray, the source of which is each light alternately.

By careful adjustment the duration of each ray is exactly the same and the two rays do not overlap. If the lights are unequal in power the oscillation of the shutter at a given speed produces a vibrating effect, but by moving the screen and shutter nearer the weaker light a balance is gradually set up until the distances are such that rays from the two sources are equal, which point is indicated on the screen by a total absence of the vibration. Under these conditions the shutter cuts off first one ray and then the other without the eye being sensible of any movement, for, although the rays may be of different colors yet the retina ceases to discern color and only judges intensity.

The introduction of this practical form of photometer, based on long-known laws, has enabled very accurate estimations to be made of the actual power of electric arc lamps and the incandescent gas (Auer) light. It appears probable that until now no correct estimation of their intensity has been made and the results obtained differ greatly from those to which the world has given credence hitherto.

A proof of the delicacy and unerringness of the readings by this photometer is afforded by the fact that when lights of the same color are tested by it the results agree exactly with those made with the Bunsen or Lummer-Brodhun apparatus; whilst, when the lights vary in color, different operators disagree totally in their readings with these photometers; but all experimentalists coincide to the smallest fraction when the same lights are tried with the Simmance-Abady instrument.

The instrument is provided with means of reversing the light receiving surfaces so as to avoid error through inequalities of material, and all angles and measurements are convenient for verification. A few minutes' examination will convince the photometrician that the apparatus is deserving of faith as a means of ascertaining the illuminating power of lights of any color.

The manufacturers are Messrs. Alexander Wright & Co., Limited, of Westminster, England.

Steam Turbines to Date.

[From a lecture by R. H. THURSTON, LL.D., before the New York Electrical Society.]

The beginnings of the steam turbine are found in the earliest historic times and in the earliest technical literature. Its progress is shown to be wholly modern and mainly recent. Only after the evolution of the modern physical and mathematical sciences could its action be understood and the machine be properly designed; only after modern tools and methods of mechanical construction had become refined could it be built in safe and economical forms. The influence of the Alexandrian school upon modern engineering is shown to have been mainly through the philosophers who sowed the seeds of which we now see the germination and the fruit. They were necessarily dormant during the nearly two thousand years which elapsed between the days of Greek philosophy and modern, practically applied, science.

The fundamental ideas of the theory of the steam turbine are exhibited as embodied in the modern steam turbine. The transformation of energy from its thermal into its dynamic form is traced and the principles controlling the thermo dynamic change and the limitation of wastes are exhibited as exemplified, both for the ideal case of the perfect machine and for the practical construction of the day. The method of development of thermal energy is exhibited and the mechanism of the process of change into dynamic form is shown.

The turbine is discovered not to be a thermodynamic machine, but to belong to the same class with the hydraulic turbine and its design, construction and operation to be controlled by the same ultimate principles. The radical distinction between the types of the ancient Greek and of the engineer of the seventeenth century is pointed out, and the influence of this difference in type upon the practical value of the invention is brought out. The limitations controlling the engineer in his design and construction due to this difference in type are exhibited, and their effect upon the economic value of the turbine is shown. Notwithstanding these limitations it is found that the turbine is more nearly a "perfect steam engine" than any other known type, so far as its design and construction are concerned. It remains to be seen what the practical outcome is to be.

The economies and the wastes of the steam turbine are discussed and it is found that the machine, if its construction can be made perfect, will operate precisely as would its purely ideal representative. Its preliminary thermodynamic conversion of enery in the formrtion of its jet within the nozzle is exactly conformatory to the scientific theory of the case and the action of the turbine itself, receiving the jet, is that which a scientific and perfect construction would illustrate, in so far as energy conversion is concerned, if the apparatus be correctly proportioned and constructed.

It is discovered, on investigation, that the wastes of the turbine, as now illustrating the best work of the time, are apparently not far different in amount from those of the best work on the older type of steam engine, the piston engine, but that these wastes are of a different sort and peculiarly distributed. The problem of their reduction is a radically different one from that of the older engine.

The present status of the turbine as respects design is shown and its relation to the ideal standard of the engineer is examined into. The Hero turbine, as used in "centrifugals," the Branca type, as employed in the same class of machines, the old Avery and Atwater types, and the recent forms of DeLaval and Curtis, Parsons and Rateau, are shown to approach the theoretical ideal more completely than ever has, or probably ever can, any reciprocating engine. It does not necessarily follow that they will ultimately excel the common type of steam engine in everyday practice; it simply means that, to this extent, they possess certain fundamental advantages. The fundamental principles of the steam turbine being now entirely familiar to the engineer, its design has become one of the simple problems of construction and may be carried out with perfect comprehension of the requirements of the case as well as of the methods of successfully meeting those demands.

The now familiar types of simple and of compound turbine illustrate the familiarity of the engineer of to-day with this task. He recognized his limitations, as set by the weakness of his materials of construction and by the essential requirements for maximum, thermal and mechanical efficiency, which make demands upon him which are in precise opposition. He effects the best compromise possible in the one case and endeavors, by a modified design, to evade those limitations in the other case. Various expedients and various special devices, some of them amounting to real inventions, are found to be more or less successful in effecting this improvement and the differences among the steam turbines of the day are largely of this sort.

The fundamental principles of the compound turbine are simple, and all forms of such machines are fundamentally the same in principle.

The performance of the steam turbine of the day, as observed by the lecturer and as shown by the work of many other investigators, is found to be excellent beyond the anticipations of the most sanguine among older practitioners. Figures presented show that the machine is about as economical as other engines of the same power, that its regulation may be made satisfactory and its adaptation to special purposes is remarkably perfect. It is found that while experience is not by any means as complete, and judgment, therefore, not so well based as with the more familiar types of engine, the conclusion is probably well justified that this form of steam engine has come to stay and that it will find its field—and a broad one—in the engineering of the future.

Opportunities for improvement are found, on investigation of the theory and of the performance of the machine, comparing the predictions of a pure theory with the results obtained in a refined practice, to be very large. The direction which these improvements must take is shown clearly by experimental research and the way is clearly visible to all scientific designers and inventors. It is easily shown that there are two, and practically only two, ways of securing further gain in the efficiency of the turbine, the one involving the refinement of the construction of the machine, the other relating to the treatment of the working fluid. The method is simple in its requirements, but the practical meeting of these requirements may involve some difficulties. However that may be, the designers of to-day are competent, well-informed, and have the scientific training needed. They may be expected in due time to attain to a high degree of success.

The characteristic advantages of the steam turbine in its now standard forms are, for certain purposes, peculiar and very important. The adaptation of the machine to driving high speed machinery, to the turning of the armature or the field of the dynamo, to the purposes of the marine engineer, present promising problems. Their solution is already well advanced, in most cases, and we already know that the turbine may be made of use in the operation of machinery, as of alternating current generators in multiple, where the difficulties with other motors are found to be singular and serious. These advantages are illustrated by the details of the engine trials and of scientifically conducted investigations lately effected.

The trend of progress and the promise for the immediate future are in the direction of further gain in economy of the machine by suppression of leakage and of friction of fluid within its casing, by improved workmanship and by securing a better working substance, by freeing it from water and also by utilizing the process of superheating to increase the thermodynamic range. This means, however, improvement at the boiler

rather than at the engine, which latter is fitted in all its forms to employ superheated steam of any temperature that can be practically furnished from the steam generator.

The trend of progress at the moment is also toward the application of specially designed and constructed turbines to special uses. It is probable that, gradually, forms will be adapted particularly to use in electric light and power plants; others will find employment as marine engines, and still others to other varieties of work. The regulation and the adjustment of speeds constitute a problem already satisfactorily solved in some cases, but which require some further consideration to adaptation of satisfactory regulating mechanism to some special forms of turbine and to some special uses.

The promise would seem at the moment to be the introduction very widely of a new type of prime mover which adapts itself in a peculiarly happy manner to purposes to which the common forms of steam engine are not likely to prove as perfectly satisfactory. The indications are that the supply of power by means of this motor will be made as low as with the best types of reciprocating engine, and possibly lower, while its simplicity of plan and ease of construction would seem to insure freedom from liability to either accident or depreciation of value to any important extent for long periods of time. The theory and the practical modification of theory in the design, construction and use of the machine are so well understood, and the real so closely approaches the ideal, that the engineer may readily see his way toward the solution of any praetical problem of design that may be presented, while he also may as readily see a remedy for any observed defect of efficiency or of mechanical action. It should, therefore, be expected that such approximation to the ideal perfect machine as is possible will soon be attained, particularly as already the study of the theory and the observation of the practice of the time with this machiue is now being made the task of an immense number of learned men of science, of able practitioners and of skillful constructors. Probably never in the history of engineering was so simple a machine made the object of investigation of so large a number of able men, inventors, constructors, engineers and men of science, and the subject of such extensive experimental research.

It is very possible that, through the development of this ancient device, we may yet see the nearest approximation to ideal thermodynamic and mechanical efficiency in the group of heat motors that man can attain.

Concentration in the Bituminous Coal Industry.

[By Mr. Frederick E. Saward, in *Iron Age*.]

One of the remarkable features of the coal industry in this country is the rapidity with which the bituminous branch has grown; it has doubled in 10 years and the end is not yet; to all appearances this will go on and on at a pace that means much for the producers thereof and for the country at large. For the producers it means the development of property that cost but little compared with present day values, and for the country it means the continued supply of a most desirable fuel at a fair rate of cost, for power and other applications. There is a point in connection with all this which means much to the consumer, and one which has not yet attracted the attention that it deserves, the concentration which has been going on in the soft coal producing districts, in view of the continued demand for this fuel. It is of the very greatest importance, since it has a tendency to steady prices. It is not at all a desirable feature to the steam user to have a fluctuating market for this very important item in his cost sheet. With the demand growing and with a number of small producers at the mercy of the carrying companies, so far as charges are concerned, and of labor unions, so far as wages and general cost of running are concerned, the fuel user of the future would be in a bad way indeed. With the trade concentrated so that the tonnage runs up into millions there is the possibility that every order, no matter how large in quantity it may be, receives prompt and desirable attention, and as has been said, at fixed prices. For the coal producer wants steadiness to his trade quite as much as does the manufacturer, and bends every effort in this direction—one price for the entire year.

In this connection of the concentration of interests it is significant how the soft coal producing companies compare with the miners of hard coal There are a number of hard coal companies in this country whose reports of their business find a way into print, upon every possible occasion, yet there are firms and corporations in the soft coal industry whose tonnage is equally as great or larger, and it is the purpose of this article to make clear this point to the reader. In its most active years the anthracite industry never went above 53,000,000 gross tons of coal shipped to market, and this was for the exceptional year of 1901, after a very considerable idleness during the preceding year. The tonnage was divided in the following proportions:

	Tons, 1900.	Tons, 1901.
Philadelphia & Reading	9,338,517	10,500,000
Lehigh Valley	6,909,442	8,310,343
Central Railroad of New Jersey	5,309,856	7,531,535
Delaware, Lackawanna & Western	6,013,849	5,927,852
Delaware & Hudson	3,973,859	5,500,000
Pennsylvania Railroad	5,169,947	5,007,622
Pennsylvania Coal Company	2,090,153	2,500,000
Erie Railroad	1,741,069	1,150,000
New York, Ontario & Western	1,658,456	2,050,000
Delaware, Susquehanna & Schuykill	1,568,488	1,590,862
New York, Susquehanna & Western	1,333,848	1,500,000
Totals	45,107,484	53,568,214

The details for the year 1902 are not yet obtainable, but the sum total was only 31,210,000 tons and each concern did about 60 per cent. of its tonnage for the preceding year. Now let us take up the figures of the soft coal interests, and it will be seen what a power in the land certain concerns are getting to be. Dominating soft coal producing concerns in the United States:

Pittsburg Coal Company	18,000,000*	
Steel Corporation companies	12,500,000	
Rochester & Pittsburg C. & I. Company	6,000,000	
Monongahela River Con. C. & C. Company	6,000,000	
Keystone C. & C. Company	6,000,000	
Berwind-White C. M. Company	5,000,000	
Webster Coal & Coke Company	3,000,000	
Westmoreland Coal Company	2,000,000	
W. T. Rainey	1,500,000	
Cambria Steel Company	1,500,000	
United Coal Company	1,500,000	
Beech Creek C. & C. Company	1 500,000	
Total for Pennsylvania		64,500,000
Consolidated Coal Company	3,000,000*	
Chicago, Wil. & Verm. Coal Company	1,250,000	
Spring Valley Coal Company	1,250,000	
Total for Illinois		5,500,000
Watson interests	9,000,000	
Davis Coal & Coke Company	1,500,000*	
Tierney interests	1,000,000	
Total for West Virginia		11,500,000
Sunday Creek Coal Company of Ohio	10,000,000*	
J. W. Ellsworth & Company, of Ohio	4,000,000*	
Tennessee C., I. & R. R. Company, of Alabama	5,000,000	
Colorado Fuel & Iron Company, of Colorado	4,500,000	
Central C. & C. Company, of Missouri	6,000,000*	
Gould Coal Companies, of Missouri	2,500,000*	
Utah Fuel Company	1,500,000	
Total for above 25 concerns		115,000,000

*Including mines in other States.

This total represents nearly one-half that of the whole bituminous product of the United States.

When these figures of the soft coal producers are compared with those of some of the anthracite shippers it is readily seen how rapidly the bituminous trade is getting away from its old time position. Anthracite will continue to be the domestic fuel for a considerable section of the country, but the vast majority of the industries will take up with soft coal to an ever increasing extent. Any trade which shows growth, as does this particular branch of the fuel industry, warrants the full attention of all engaged in the discussion of economic subjects. Doubtless this comparison will come as a revelation to many; it has never before been presented in the graphic fashion now placed before the reader.

Juries in Technical Trials.[1]

[By Mr. Egbert P. Watson.]

"He jests at scars who never felt a wound," but the man who has taken a technical case into court which he has spent weeks in preparing, fitted each link in the chain of evidence carefully so that there are no weak places in it, and then seen it fail to convince the jury because they did not comprehend the issues at stake, does not feel much like jesting. He feels much more like anathematizing the system which permits men of one trade or calling to sit in judgment upon technicalities of another trade which they know nothing about; dentists trying to solve the difference between Smith's loom and Jones' loom when none whatever exists except that Jones has used hexagon nuts where Smith used square

1. *Iron Age*.

ones, or has only stolen nine-tenths of Smith's invention instead of the whole outright. Time was when men could not make "colorable imitations" of existing machines, but it seems that they can now and escape suits for infringements of patents. An engineer patented a boiler which contained many novel features, all of which were covered by claims. A firm took the invention bodily as shown in the patent papers, omitting one detail only. The inventor protested against the steal, but the attorney for the appropriators pointed out that they had not taken all, only the chief parts. No action could lie against them.

A case was recently investigated by a coroner's jury to determine the responsibility for a collision on a railway, by which many lives were lost. The coroner was a zealous man who intended to do his whole duty in the premises, even more if necessary, for he so charged and directed the findings that the jury aforesaid were mere puppets; except for the legal forms required he might have been the whole thing himself, which in point of fact he was. Now if the coroner had possessed any knowledge of the technical causes leading directly to the disaster so called it might have been his plain duty to lead the jury in the right path, but it was so evident during his examination that he did not that the result of his investigation was worthless. He accepted mere gossip of the round house and the opinions of laymen as *de facto* evidence in regard to the condition of one of the engines in the collision, and ignored the record of the railway repair shops as to the working of the locomotive. There was a strong public feeling against the railway for the alleged reckless mismanagement of its affairs, and there were plenty of letters published from ignorant laymen suggesting improvements in the engines and telling the directors how to run the road safely. To all this the coroner gave careful attention; he was so biased by it that he could see no other aspect of the case. The dying engineer confessed judgment as to his overlooking signals which would have prevented the disaster but no weight was given to this fact, the sole aim, apparently, being to fasten responsibility upon the railway company.

Again, a suit was brought against an individual to obtain a balance due upon a house heating boiler sold him. The buyer alleged defective construction and performance, refusing payment. Testimony purely technical was given by both parties to the suit, and in the course of it the experts brought into the case had things all their own way. That is to say, through the respective counsel they examined and cross examined each other at great length, the attorneys being as sheep led to the slaughter so far as active participation in the suit went. It was sought to show for the defendant that the steam made by the apparatus was very wet, a point in the defective performance of the boiler; but the plaintiff's expert asserted that this was not so because there was a superheater inside. On being called on to show the superheater he showed portion of an arch that projected above the normal water line not wet by the water in the boiler. Being further questioned as to his knowledge of superheated steam, why it was so called and how it could be hotter than the water it was generated from in direct communication with the said water, he balked, hesitated, and got into a no thoroughfare of explanation, which made the jury sit up for the first time during the trial. At this critical juncture the defendant in the case leaned over to his attorney, and said: "Oh, cut it out, and get on with the next witness!" thereby destroying any advantage he might have gained previously, and losing his case eventually through a want of proper procedure.

The facts just narrated lead up to the class of jurors usually empaneled in technical trials. These have no relation whatever to the case to be tried, but are taken haphazard from the worthy citizens of the community at large. I hold that this is, on the face of it, an absurdity, for how can men not conversant with the technicalities of any calling comprehend the bearing of the testimony given? Suppose a lawyer is cited to appear for unprofessional conduct. There in the seats of the mighty sits my friend the butcher, next is the baker, after him is the candlestick maker, and the whole tally is represented by every calling which men follow for a livelihood. They are not only wholly ignorant of the bearing of the charges made, but they are also totally uninterested in it, and feel as if they are being imposed upon to be compelled to listen to the testimony. It is not surprising that ridiculous verdicts should be rendered under the circumstances.

Is it unreasonable to propose that special juries should be called for special cases? The average man is quite capable of adjudicating upon a dispute as to a bill for laundry service, but what absurdities are perpetrated when men are called upon to decide as to whether a lady's dress is properly fitted? It seems only fair that women should be called in, but as they are exempt from jury service this will probably not be done. But there is no safety for litigants when men who are ignorant of the first principles of the technical cases they sit in judgment upon hold the balance of power. "Not guilty, but don't do it again," is as likely to fall from their lips as anything else. Engineers should be judged by engineers, and seamen by those who know the bow of a vessel from the stern at least; precedent and rule of law govern, and and will for a long time to come, doubtless; meanwhile those who invoke the law and jury trials are said by a keen satirist, Butler, to be unwise at least, to wit:

> "He that with injury is grieved,
> And goes to law to be relieved,
> Is sillier than a sottish chouse;
> Who, when a thief has robbed his house,
> Applies himself to cunning men
> To help him get his goods again."

The conservative element in the legal profession would probably object to any change in the methods of obtaining a jury for technical cases, in that it might prove a dangerous precedent, but if any member of the bar was cited to appear on trial for unprofessional conduct which would he prefer: a jury of his peers, members of his own profession, or Tom, Dick and Harry, the average panel furnished by the sheriff? In the case of incompetent witnesses on the stand summary action is taken promptly; why should not the same rule obtain in the case of incompetent jurymen? No. 3 juror in the first row is observed to have "the wandering eye which bespeaks the vacant mind;" he is sure to be the one who will disagree with all the others when the testimony is considered. Why should he not be dismissed at once by the judge, let me say, and possibly fined for malversation?

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. R. W. EMMONS, 2D, has been elected Treasurer of the Lawrence (Mass.) Gas Company, vice Mr. G. P. Gates.

MR. M. EARL BRACKETT, Secretary of the Petoskey, Bay View and Northern Gas Company, of Petoskey, Mich., is our authority for the statement that the plant will be in operation by June 1st.

THE Transatlantic Gas Company, capitalized in $1,000,000, has been incorporated in Camden, N. J., by Messrs. J. Albert Odell, Frank A. Stonecipher and Chas. H. Bowman, all residents of Pittsburg, Pa.

MR. JANSEN HAINES, of Philadelphia, has been appointed temporarily Manager of the Capital City Gas Company, of Des Moines, Ia., vice Col. E. G. Pratt.

THE proprietors of the Bridgeton (N. J.) Gas Light Company are arranging for the construction of a storage holder.

THE following is the report of the committee of the Hartford (Conn.) City Council appointed to consider the feasibility of engaging the city in the construction and operation of a municipal gas plant: To the Honorable Court of Common Council: Gentlemen—The committee appointed by your honorable body on October 27, to inquire into the advisability and feasibility of the city of Hartford acquiring or constructing a municipal gas plant, as recommended by his honor, the Mayor, beg leave to report that they have given the question thorough and conscientious investigation and are of the opinion that it is unwise for the city to construct a gas plant, or to acquire the plant of the Hartford City Gas Light Company. We would respectfully call your attention, briefly, to the debt of the city, as given by one of the members of the treasurer's office, who kindly appeared before this committee, as follows:

Net present and future debt (after deducting sinking fund and water debt)	$4,823,000
Grand list and corporation stock list	82,000,000
Massachusetts law regarding investment of trust funds, 5 per cent. of grand list	4,100,000
New York and Connecticut law, 7 per cent	5,740,000

You will readily see that the debt of the city is rapidly nearing the limit where banks will be barred by law from buying these bonds for the investment of trust funds, and the credit of the city may be thereby impaired. We are unable to say how much the increased debt would be if the city should acquire a gas plant, but it would certainly represent a large amount. Your committee find upon investigation, and inquiry of the Secretary of the League of American Municipalities, in our search for data bearing upon this subject, that in 18 of the cities in the United States who own and operate gas plants, of this number two furnish gas to consumers at a less price than the Hartford City Gas Light Company, and three at the same rate. Your attention is called to the fact that all of these plants are situated near the coal and oil regions, thus reducing the cost of transportation to a minimum, saving to

the plants on freight rates alone, over cost of gas manufacture in that section, of from 15 to 25 per cent. The charges of the remaining 13 cities to consumers range from $1.20 net per 1,000 feet in the city of Alexandria, Va., to $1.85 in the city of Wakefield, Mass. Your committee are of the opinion, after a careful study of the reports upon these plants, and after conferring with many business men, that it is unwise for the city of Hartford to go into the manufacture of gas, either as a business propostion or with the idea that the price of gas could be reduced to the people by municipal ownership.

Respectfully submitted, EDWARD S. TRYON,
GEO. W. SCAILES,
ROBERT C. GLAZIER,
FRANK M. MATHER.

DURING the year 1902 the Streator (Ills.) Company piped 400 houses, and placed 220 gas ranges.

RECENT contracts awarded to the Western Gas Construction Company, of Fort Wayne, Ind., are: A coal gas plant for the Xenia (O.) Company, up to an output of 125,000 cubic feet per diem; a new coal gas plant, up to a capacity of 150,000 cubic feet per diem, for the Baraboo (Wis.) Gas and Electric Light Company.

MR. GEORGE G. RAMSDELL, General Manager, Connelly Iron Sponge and Governor Company, of New York, writing to us under date of the 30th ult., says: We note in your issue of March 30th, in Mr. N. H. Humphry's letter from England, referring to the new works in Edinburgh, Scotland, he uses this language: "It includes two of the largest rotary exhausters in existence, each driven by means of a 125-horse power gas engine, and capable of dealing with 750,000 cubic feet of gas per hour." Evidently Mr. Humphrys is not thoroughly posted on what is going on in the exhauster line in this country. We have a number of rotary exhausters of the Root type in daily use here, capable of dealing with 835,000 cubic feet of gas per hour, two of which were recently installed in this city. We have also recently made propositions on several very much larger exhausters, two of which are guaranteed to have a capacity of 1,250,000 cubic feet per hour, at a pressure of 6 pounds. These exhausters alone will weigh about 148,000 pounds each.

PROF. F. G. BAUM, of the Electrical Engineering Department of the Stanford (Cal.) Universtty, has been appointed Assistant Engineer to the Californria Gas and Electric Corporation. It is understood that his new position will not interfere with his duties at the University.

WRITING about the California Gas and Electric Corporation puts us in mind of the fact that, according to a San Francisco correspondent, "The California Gas and Electric Corporation is the name of the new Company formed by the consolidation of the Bay Counties Power Company, the Valley Counties Power Company, California Central Gas and Electric Company, Fresno Gas and Electric Light Company, Sacramento Electric, Gas and Railway Company, and the Oakland, Gas, Light and Heat Company. The Company supplies light and power in 16 counties of the State and to 31 towns, of which Oakland is the largest. The outstanding bonds of these corporations amount to $8,745,000, and the new combine is authorized to issue bonds to the amount of $10,000,000. The Company is now about to place on the market 30-year gold bonds in the amount of $1,500,000. The officers and directors of the combination are: E. J. de Sabla, Jr., President; John Martin, Vice-President; John C. Coleman, Vice-President; R. M. Hotaling, Treasurer; John A. Britton, General Manager; E. W. Hopkins, J. Henry Meyer, N. D. Rideout, R. R. Colgate, Frank B. Anderson and Frederick W. Zeile, Directors. This combination was begun about a year ago, and the holders of the stock of the Oakland Gas, Light and Heat Company received about $20 a share above the market price at the time the option was secured. There has been a suspicion that perhaps this corporation was interested in the options recently secured on the stock of the Equitable and Independent Gas and Electric Companies, of San Francisco. All concerned, however, deny the rumor, claiming that the California Gas and Electric Corporation aims to control only the light and power supply of the smaller towns throughout the State."

ACCORDING to a correspondent, "Ground has been broken and the foundations for the new plant of the Stacey Manufacturing Company are being erected, on the site purchased some time ago at Elmwood Place, O. The plot is bounded on the north by Township avenue, on the west by the C. C. C. and St. Louis Railway, and on the south by the C. P. & V. Railway. The plant will consist at present of 4 buildings: A machine shop, 130 feet by 500 feet; a foundry, 90 feet by 200 feet; a pattern shop, 30 feet by 60 feet; and a fireproof pattern vault, 30 feet by 30 feet. The buildings will be constructed of brick and iron, with slate roofs. North light skylights for lighting up the interiors, so far as natural illumination may be depended upon, will be used. The construction is all practically fireproof, wood being used only for the doors and windows and for the floors of the offices. The north and south ends of the machine shop will be two stories high. The main entrance is in the center of the north side, through the shipping office, with a doorway on the east for wagons and a doorway on the west for the railroad spur. The entire second floor on north end of the machine shop will be used for the general offices, the offices of the President, Secretary, etc., the draughting room, storage vault for books, etc. The entire second story on the south end is to be used for laying off the planning for large circular work. The plant was designed by and its construction will be carried out under the direct supervision of Mr. Henry Hake. An excellent diagram of the plant was printed in a recent issue of the Cincinnati *Enquirer*."

MR. R. G. BUCKLIN, formerly of Lakewood, N. J., has been appointed Superintendent of the Fishkill and Matteawan (N. Y.) Gas Company, vice Mr. Alfred L. Woollen, resigned.

MENTIONING Mr. Woollen's resignation recalls the fact that shortly before he severed his connection with the Fishkill Company—his resignation became effective the 1st inst.—the employees presented him with a handsome gold watch chain and charm as a token of their esteem and good wishes.

THE Governor of Missouri has vetoed the bill, originally presented to the Legislature by Senator Martin, permitting gas and electric light companies to acquire property by the right of eminent domain.

THE United Coke and Gas Company of this city will, on the 1st prox., remove its general offices to Camden, N. J., to premises located on the corner of Second and Cherry streets.

MR. G. SCOTT ANDERSON has applied to the Council of Wallace, Idaho, for the right to there construct and operate a gas works. In consideration of such a grant he agrees to furnish all gas needed in the public buildings free of charge.

THE Cincinnati Gas and Electric Company has awarded the contract for the disposal of all the surplus coke made on its works to William Clauss. The Marmet Company has had a monoply of this trade for something like 25 years.

MR. W. A. BAEHR, formerly in charge of the engineering departments of the Denver (Col.) Gas and Electric Company, and who resigned therefrom to act as Chief Engineer of the Laclede Gas Light Company, of St. Louis, Mo., on the eve of his departure for that city was presented by the employees with a valuable gold watch and chain.

THE next quarterly dividend of the New Bedford (Mass.) Gas and Edison Light Company (it is payable on the 15th inst.) will be 1¾ per per cent., an increase of ¼ per cent. over the rate that has prevailed for some years.

A CORRESPONDENT in Boone, Ia., forwards the following: "Some evenings ago, at the rooms of the Capital City Gas Company, of Des Moines, Ia., 30 heads of departments of the Company, and the office force, gathered about the banquet board to bid farewell to the departing President, Col. E. G. Pratt. A silver loving cup was presented to Colonel Pratt as a token of the esteem in which he is held by those with whom he has worked since he came to the city. The presentation speech was made by Jos. Goodbarn, the oldest employee of the Company in this city, who has been in its employ for the past 25 years. Mr. Goodbarn said: 'Colonel Pratt, in behalf of the men with whom you have been associated since you have been in our city, I have the honor of being their representative in presenting you with this cup as a slight token of the esteem in which we hold you, and the appreciation which we have for your efforts in our behalf. We are sorry to lose you and your association in our work, but at the same time we are glad to see you go to a place where you are so sure to better yourself. Des Moines the loser and at the same time Milwaukee is the gainer, and again is the saying that it is an ill wind that blows no one good, is brought into play. When you came to take charge of the work in this city in 1887, there were in Des Moines 1,300 meters and now when you are about to leave us, there are 10,000 in this city. This has been accomplished by good, hard, conscientious work, and no one has done more than yourself. Throughout all this time you have been in close touch with those

with whom you have labored, and there is no employee who has at any time, been connected with the Company but wishes you Godspeed in your new home, and who does not feel confident but that you will in time be loved as greatly as you are by those who are now to bid you good bye.' Colonel Pratt's reply was in part as follows: 'Friends: This is the last time when we will meet at these, our business meal times, and it is with a feeling of regret that I part with you with whom I have been so long associated in our work. I thank you for this token, which I will hold as one of the most cherished of the things I possess. I will always remember these days spent in the city of Des Moines as among the best of my life and as time goes on I assure you that my interest in you and your success will always be that of a friend. Again I thank you for the cup which you have so kindly presented me.' On the cup was the inscription: 'Presented to Edward G. Pratt, March 25, 1903, by the employees of the Capital City Gas Light Company of Des Moines, Iowa.'"

The Market for Gas Securities.

The prevailing feature of the city gas share market during the week was mistrust, nor was it based on the possible outcome of the attempt going on in Albany to engage the city in the operation of a municipal lighting plant. The real cause of the uncanny feeling is undoubtedly in the unsettled conditions governing money, and the scarcity of traders for the long side. It is certain that quite a short interest exists in Consolidated, which short interest is largely due to sales made by certain legislators and their "allies" when the municipal movement was instituted. In our opinion they cannot "cover" too soon. On Thursday last a delegation from the Merchants' Association, of New York, was before the Assemblies Committee on Cities, urging the passage of the Finck municipal bill. It is an even thing that not one of its advocates could tell a dynamo from a gasholder. There is no likihood that the bill will pass. Consolidated closed to-day (Friday) at 205 to 206. There is some inquiry for the Standard issues.

Brooklyn Union still remains on the very low side, with but few actual transactions. The nominal rates are 205 to 211. Peoples, of Chicago, is unchanged, and Washington (D.C.) gas is a bit weaker. Baltimore Consolidated is dull and firm, and Lacledes are also on the declining list.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

APRIL 6.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	205	206
Central Union, Bonds, 5's	3,000,000	1,000	109	111
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	310	325
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co. ..				
Bonds, 5's	11,000,000	1,000	112½	113
Northern Union, Bonds, 5's.	1,250,000	1,000	104	107
New York and East River				
Bonds 1st 5's	3,500,000	1,000	112	113
" 1st Con. 5's	1,500,000	..	109	111
Standard	5,000,000	100	132½	140
Preferred	5,000,000	100	152	160
Bonds, 1st Mortgage, 5's	1,500,000	1,000	115½	118
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	205	211
" " Bonds (5's)	15 000,000	1,000	119	119½
Bay State	50,000,000	50	⅜	⅛
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	8⅛	10
" " Bonds, 5's	5,256,000	1,000	79	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Central San Francisco	900,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas & Elec. Co.	29,500,000	100	98	98⅛
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	101	101⅛
Columbus (O.) Gas Lt. & Heating Co	1,662,750	100	88¾	89⅛
Preferred	3,026,500	100	107⅛	109
Consumers, Jersey City Bonds	600,090	1,000	103	106
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore	11,000,000	100	70¼	70⅝
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	85	87
Consolidated G. & E. Co.'s.				
Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	..	89
" Prior Lien 5's	5,603,000	1,000	99¼	100
Detroit Gas Co., 5's	861,000	1,000	77	79
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	34	38
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104¼	105
Hartford	750,000	25	245	265
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	80	85
" Bonds, 6's	2,650,000	..	105	107
Jackson Gas Co	250,000	50	73	75
" 1st Mtg. 5's	200,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	92½	97⅛
Preferred	2,500,000	100	95	105
Bonds	10,000,000	1,000	109½	110
Lafayette Gas Co., Ind.	1,000,000	100		60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	130	140
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	107½	108¼
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	184¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	105	105¾
New Haven	1,000,000	25	300	325
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	.
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	101¼	102
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87¼	90
San Francisco, Cal.	10,000,000	100	52¾	53
St. Joseph Gas Co.				
" 1st Mtg. 5's	751,000	1,000	95	96¼
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	92	93
Syracuse, N. Y.	1,975,000	100	42	45
Bonds	2,047.000	1,000	98¼	99½
Washington, D. C	2,600,000	20	408¾	411¼
First mortgage 6's	600,000	..	..	..
Western, Milwaukee.				
Bonds, 5's	4,000,000	..	109¼	110
Wilmington, Del.	600,000	50	202	..

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STOCKHOLDERS' MEETING.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., February 27, 1903.

The Annual Meeting of the Stockholders of the United Gas Improvement Company will be held at the office of the Company, northwest corner of BROAD AND ARCH STS., PHILADELPHIA, on Monday, May 4, 1903, at 12 o'clock, noon, for the purposes of electing a President and six Directors, to serve for the ensuing year, considering and acting upon the subject of a proposed increase in the capital stock of the Company from 565,000 shares, of the par value of $50 each, to 734,500 shares, of the par value of $50 each, and transacting such other business as may properly come before the meeting.

The stock transfer books will be closed from 3 P.M., April 28, until 9 A.M., May 5th.

By order of the Board of Directors.

1448-8 LEWIS LILLIE, Secretary.

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., March 11, 1903.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable April 15th, 1903, to stockholders of record at the close of business, Mar. 31, 1903. Checks will be mailed.

1450-4 LEWIS LILLIE, Treasurer.

MISS LILY HAXWORTH,

Cooking Teacher and Lecturer,

(GOLD MEDALLIST),

Is open for engagements. For terms, etc.,

1441-3m Address 323 QUINCY ST., BROOKLYN, N. Y.

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1452-tf Address, "G. A.," care this Journal.

Position Wanted

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Sixteen Years' Experience in the Gas Business.

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1451-2 "J. W.," care this Journal.

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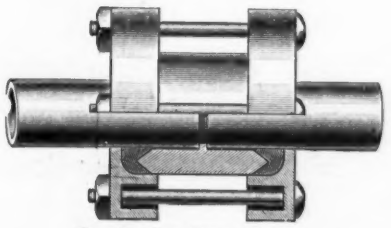
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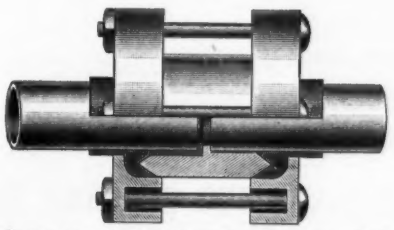
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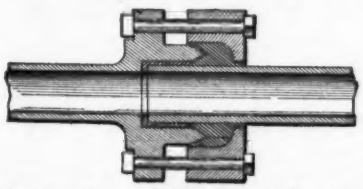
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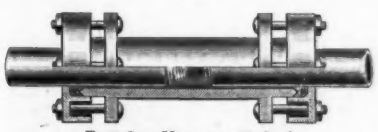
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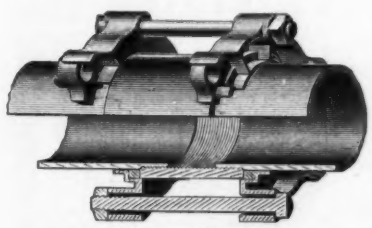
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My Insulating Coupling prevents the destruction of pipe by electrolytic action, in either water or gas lines.

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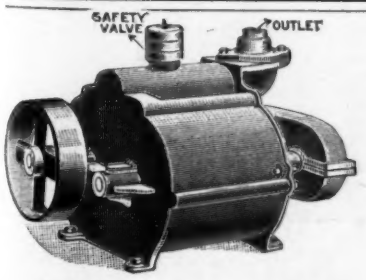

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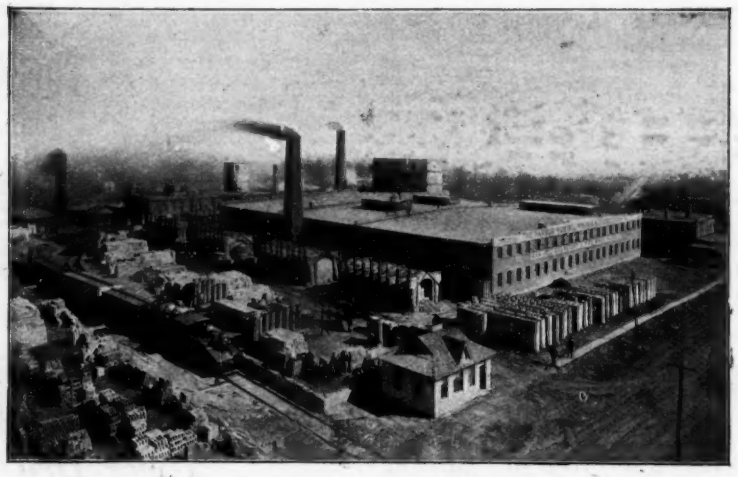

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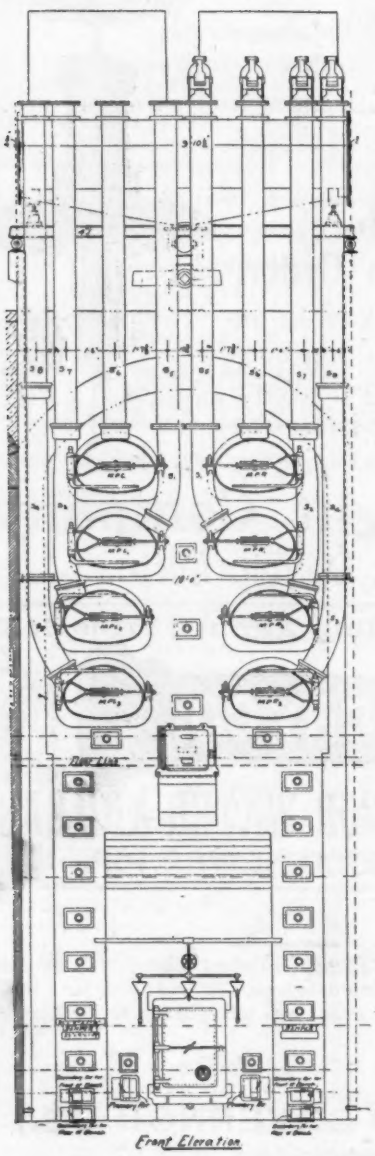

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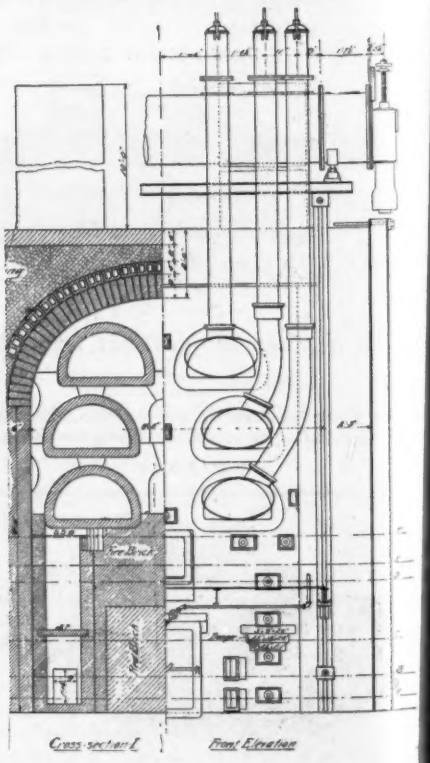

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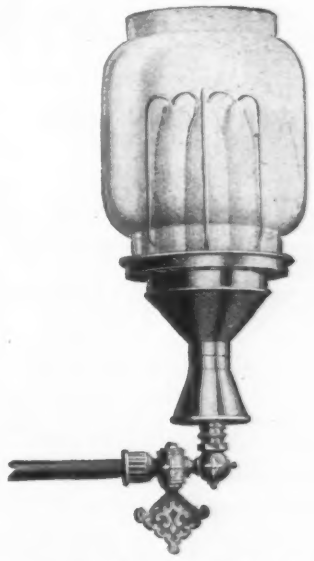

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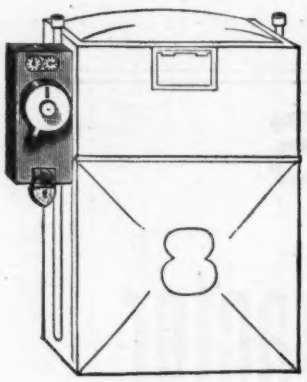

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Of Uniform Excellence and Greatest Candle Power.

BEWARE OF IMITATIONS.

WILLIAM M. CRANE CO.,

1131-1133 Broadway, New York,

SOLE AGENTS FOR UNITED STATES.

Have you seen Bray's new "LUTA" burner for acetylene gas?

"THE MINER"

Globe

Street and Boulevard

Lamps.

Cheapest and Best.

THOUSANDS IN USE WITH INCANDESCENT BURNERS.

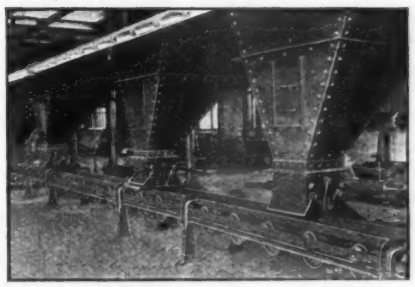
Send for Catalogues.

THOMAS T. W. MINER,

821-823 Eagle Av., N.Y.

"HUNT" NOISELESS COAL CONVEYOR.

Complete Coal Handling Installation for Gas Works.

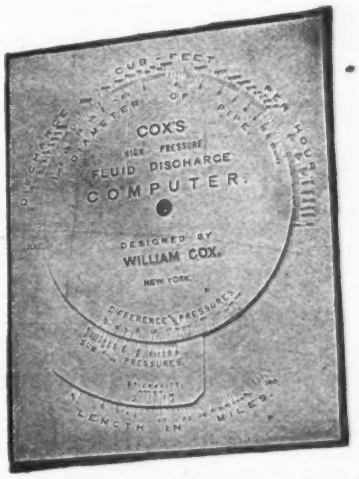


Thirty-one Years' Experience. Write for Catalogue 0011.

C. W. HUNT COMPANY, West New Brighton, N. Y.

NEW YORK OFFICE, 45 BROADWAY. PITTSBURG OFFICE, 515 PENN AVENUE.

Cox's High Pressure Fluid Discharge Computer.



This Computer solves the following formula, which is applicable to Gas, Air and other elastic fluids, flowing through long pipes with high initial pressures:

Discharge in cubic feet per hour at atmospheric pressure $= 33.3 \sqrt{\frac{d^5 \times (p_1^2 - p_2^2)}{L \times w}}$

Where

d = diameter of pipe in inches,

p_1 = absolute initial pressure in pounds per square inch,

p_2 = absolute terminal pressure in pounds per square inch,

L = length of pipe in miles,

w = specific gravity of the fluid when air = 1.

To Find the Discharge from a Pipe and the Required Size of Pipe.

(1.) Set the specific gravity of the fluid opposite the length of pipe;

(2.) Bring the DIFFERENCE of the initial and terminal gauge pressures opposite the SUM of the initial and terminal gauge pressures;

(3.) Opposite any diameter of pipe will now be found the discharge in cubic feet per hour at atmospheric pressure; and

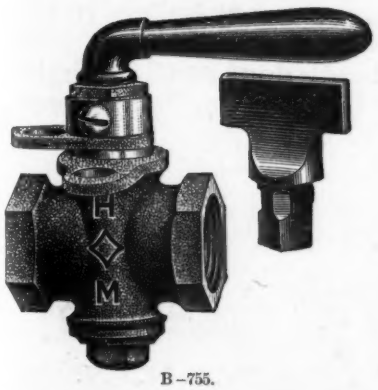
(4.) Opposite any desired discharge will also be found the required diameter of pipe.

Price of the Computers, in Cloth Case, 6½ x 8 inches, $5 Each, Net.

For Sale by

A. M. CALLENDER & CO., 42 Pine Street, New York City.

Mueller Gas Cocks.



B-755.

TOO little is not as much as you pay for, and too much is more paid for than you need.

In **Mueller Gas Cocks** you find a happy medium--not so little metal as to leave them weak, nor yet so much as to make them costly.

Made in 145 styles, seven sizes in each style.

MADE ONLY BY

H. MUELLER MFG. CO.,

DECATUR, ILLS., U. S. A.

THE

Ludlow Valve Mfg. Co.,

TROY, N. Y., U. S. A.

Double and Single Gate Valves, ¼" to 72",

—FOR—

Gas, Water, Steam, Oil, Ammonia, Etc.

HOT GAS VALVES A SPECIALTY.

Send for Catalogue.

LLOYD CONSTRUCTION COMPANY,

DETROIT, MICH.

LOWE DOUBLE SUPERHEATER WATER GAS APPARATUS.

Coal Gas Condensing and Scrubbing Apparatus.
Purifiers with Plain or Reversing Center Valves.
The Lloyd System of Valve Connections.
PLAIN OR REVERSING (PATENT APPLIED FOR).
Oxide, Coal and Coke Elevators and Machinery.
Pipe Specials, all sizes. A. G. L. Asn. Standard.
Structural Steel Work, Floors, Angle and Gate Valves.

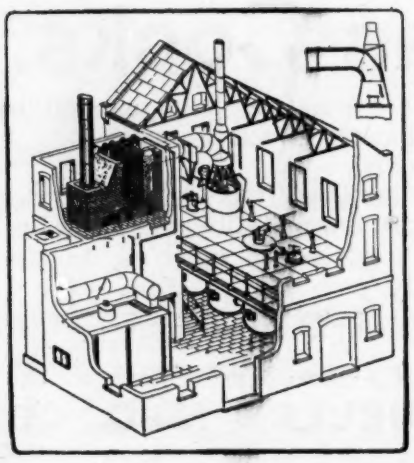
General Western Agents for BARTLETT, HAYWARD & CO., Baltimore, Md.

COAL GAS CONDENSATION SYSTEM. THE "MAYER" PATENTED TAR EXTRACTOR. THE STANDARD ROTARY WASHER-SCRUBBER. STETTIN SYSTEM INCLINED BENCHES, HYDRAULIC VALVES, ETC., ETC.

Economize Heat in Water Gas Plants,

BY UTILIZING A

Green's Economizer,



To absorb the heat now going to waste when you blow through your superheater to heat the feed water for your boilers to the temperature of the steam. This is now being done at the Poughkeepsie Gas Works, Poughkeepsie, N. Y. : : : : :

Write for full particulars how this is accomplished, the saving effected, and the advantages gained, to the

GREEN FUEL ECONOMIZER CO.,
MATTEAWAN, N. Y.

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Plans prepared and Estimates furnished at short notice.

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Chollar's System of Gas Purification.

THE PURIFIED GAS REVIVES THE FOULED OXIDE.

THE GAS ENGINEERS' POCKET-BOOK.

By Henry O'Connor,

Comprising Tables, Notes and Memoranda relating to the Manufacture, Distribution and Use of Coal Gas, and the Construction of Gas Works.

PRICE, $3.50.

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P. H. & F. M. ROOTS CO., Mfrs. of Gas Exhausters, Blowers, etc.,

Connersville, Ind., - - - - 109 Liberty Street, New York City,

Occupies this Space Every Alternate Week.

Connelly Iron Sponge and Governor Co.,

395 Broadway, New York City.

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GEO. G. RAMSDELL, General Manager. S. F. HAYWARD, Treasurer.

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AGENTS FOR THE UNITED STATES,

JONAS DRAKE & SON

SYSTEM OF

Inclined Retorts.

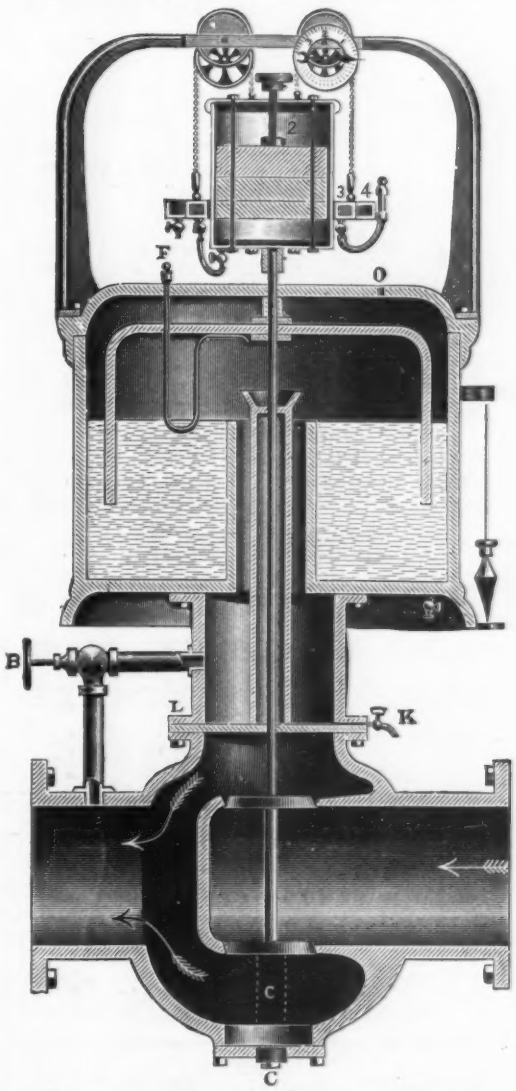
ZIMMER SWINGING CONVEYORS,

FOR HANDLING COAL OR COKE.

Jones Jet Photometer.

GAS SPECIALTIES.

CONNELLY'S



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MODEL OF 1900.

CONSTRUCTORS OF COAL GAS APPARATUS.

"GLOBE" SPECIALS, VALVES, ETC. "GLAMORGAN" PIPE FITTINGS

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FLANGE GAS AND WATER PIPE

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CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

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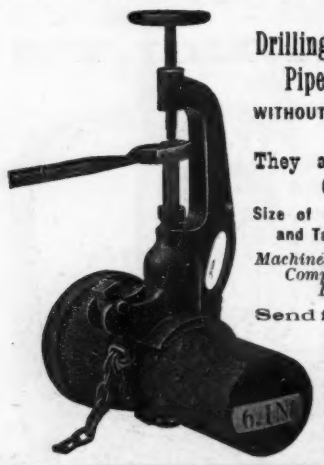

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Drilling and Tapping Pipe under Pressure

WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

Size of Combination Drills and Taps ¾ to 4-inch.

Machines Sent to any Gas Company for Thirty Days' Trial.

Send for Circulars

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THE ECONOMICAL GAS APPARATUS CONSTRUCTION COMPANY, LIMITED,

Engineers and Builders of water and coal gas apparatuses and general gas works machinery. : : :

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Valuation of Gas, Electricity and Water Works

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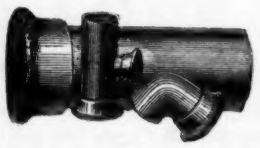

Established 1856. Works at Phillipsburgh, N. J.

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FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc.

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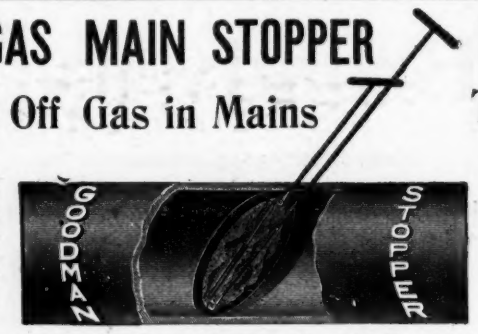
Temporarily during alterations and repairs. : : : :

Any size gas main can be shut off in 30 seconds. : : :



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THE No. 8

Humphrey Crescent Instantaneous Water Heater

IS A QUICK SELLER.

PRICE,

$20.00.

SHELF AND BRACKET FREE.

HAS NO EQUAL AT THE PRICE.

TRY ONE AND BE CONVINCED. WILL SEND ON 60 DAYS' APPROVAL.

HAVE YOU OUR CATALOGUE?

The Humphrey Mfg. and Plating Co.,

KALAMAZOO, MICH., U. S. A.

Parson's Steam Blower

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREEZE OR OTHER WASTE MATERIAL.

PARSON'S TAR BURNER,

FOR USING COAL TAR AS FUEL.

PARSON'S AIR JET TUBE CLEANER,

FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial.* No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY.

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ESTABLISHED 1834. INCORPORATED 1863.

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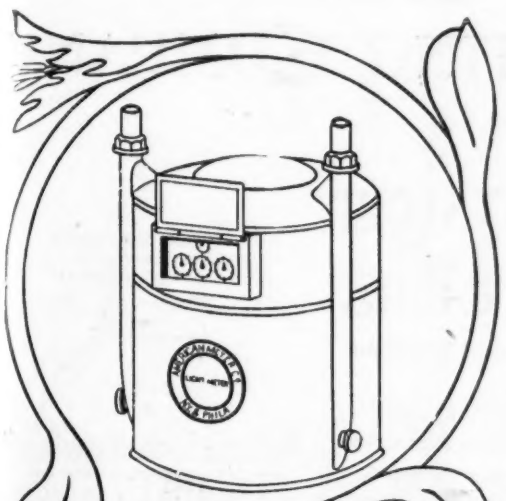
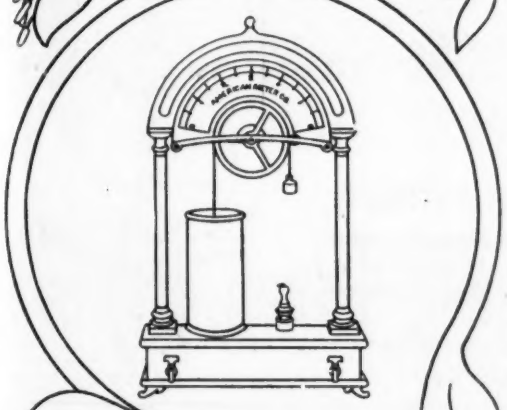
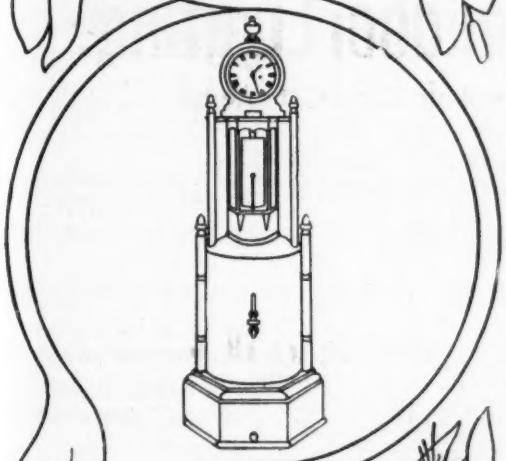
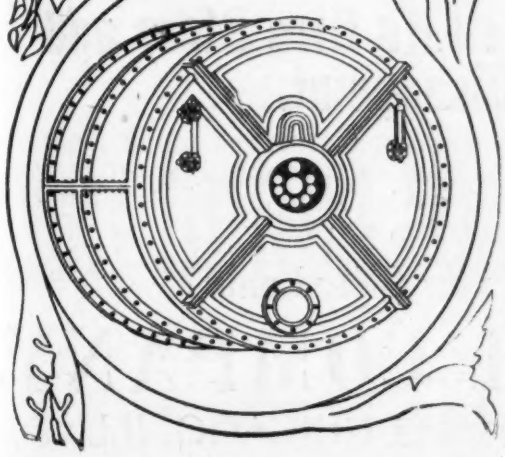








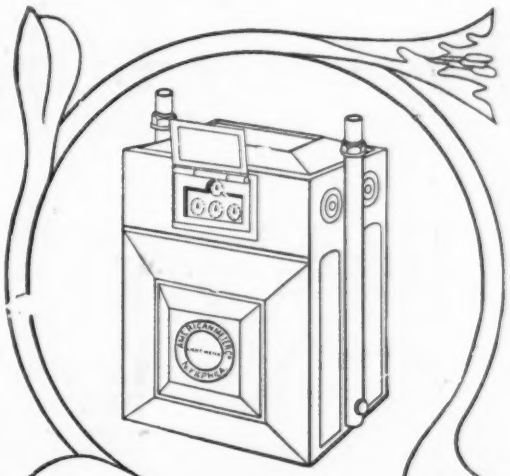
PUBLIC LIGHTING TABLE.

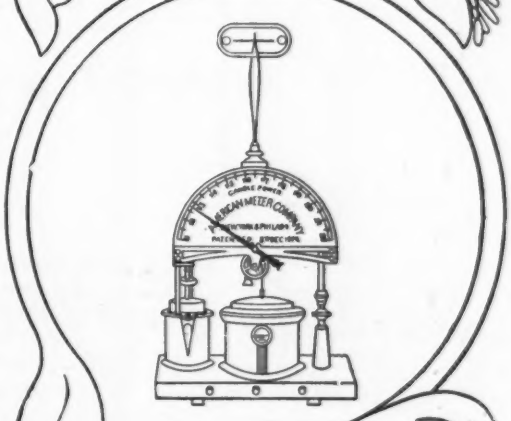
APRIL, 1903.

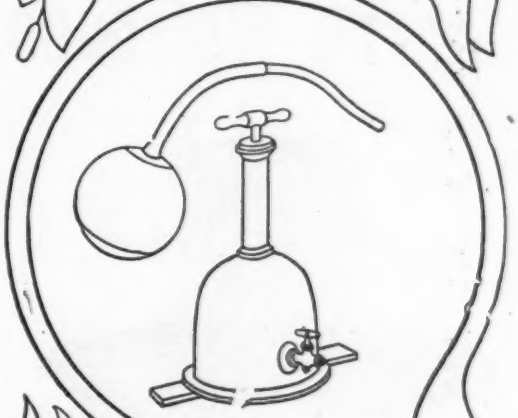
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Wed.	1	6.50 PM	4.50 AM	6.10	4.55
Thu.	2	10.30	4.50	6.15	4.40
Fri.	3	11.30	4.50	6.15	4.40
Sat.	4	12.20 AM FQ	4.50	6.15	4.40
Sun.	5	1.10	4 40	6.15	4.40
Mon.	6	1.50	4.40	6.15	4.40
Tue.	7	2.30	4.40	6.15	4.40
Wed.	8	3.10	4.40	6.15	4.40
Thu.	9	3.40	4.40	6.25	4.30
Fri.	10	No L.	No L.	6.25	4.30
Sat.	11	No L. FM	No L.	6.25	4.30
Sun.	12	No L.	No L.	6.25	4.30
Mon.	13	7.10 PM	9.30 PM	6.25	4.30
Tue.	14	7.10	10.30	6.25	4.30
Wed.	15	7.10	11.20	6.25	4.30
Thu.	16	7.10	12.10 AM	6.30	4.20
Fri.	17	7.10	1.00	6.30	4.20
Sat.	18	7.10	1.40	6.30	4 20
Sun.	19	7.10 LQ	2.20	6.30	4.20
Mon.	20	7.10	2.50	6.30	4.20
Tue.	21	7.10	3.20	6.30	4.20
Wed.	22	7.10	4.00	6.30	4.20
Thu.	23	7.10	4.10	6.40	4.10
Fri.	24	7.10	4.10	6.40	4.10
Sat.	25	7.10	4.10	6.40	4.10
Sun.	26	7.20	4.10	6.40	4.10
Mon.	27	7.20 NM	4.10	6.40	4.10
Tue.	28	7.20	4.10	6.40	4.10
Wed.	29	7.20	4.10	6.40	4.10
Thu.	30	7.20	4.10	6.45	4.00

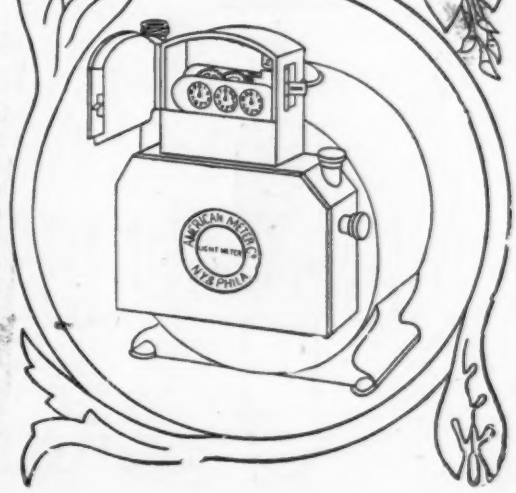
TOTAL HOURS LIGHTING DURING 1903.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	245.00	January	423.20
February	192.00	February	355.25
March	201.00	March	355.35
April	167.20	April	298.50
May	152.00	May	264.50
June	131.00	June	234.25
July	140.40	July	243.45
August	156.20	August	280.25
September	171.20	September	321.15
October	198.20	October	374.30
November	216.30	November	401.40
December	232.10	December	433.45
Total, yr.	2203.40	Total, yr.	3987.45





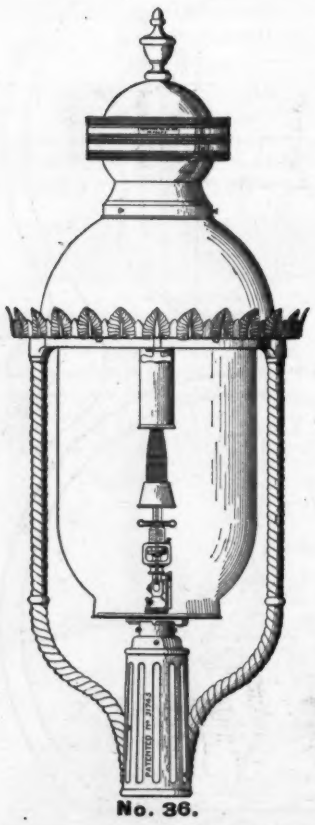




NEW YORK, 33 Nassau Street. PHILADELPHIA, Broad and Arch Streets. CHICAGO, Foot of Orleans Street. BOSTON, 624 Tremont Building.
CLEVELAND, 809 Cuyahoga Building. ST. LOUIS, 712 Roe Building. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



No. 36.

Controls and Operates the

Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others Interested in Municipal and Outside Lighting.

No. 38.

The Welsbach Gas Arc for Indoor Lighting.

The cut tells the story—but not all of it. Get one lamp and light it—then the tale's told from beginning to end. For one Welsbach Gas Arc Lamp is a better salesman than 20 pages of advertising.

Here's what it would show if you give it a chance to prove its worth:

1. A mechanical construction and finish that insures the greatest durability.
2. The renewal of mantles and the cleaning of globes without removal of globe.
3. The greatest amount of candle power with least consumption of gas.
4. A by-pass cock so constructed as to permit all or only one mantle burning at a time.
5. A pilot light that consumes but 1 foot of gas in 24 hours. Costs $\frac{1}{10}$ of a cent a day.

Give it a Chance to Tell its Own Story and it Won't Disappoint.

Let us send you one lamp—doesn't cost a fortune—and it will answer every question you put to it; make good on every test given it. You know the only proof of the pudding? What's the use in a fellow telling you it tastes good? Taste it yourself, then you know.

May we Send you ONE Lamp?

WELSBACH COMPANY,

GLOUCESTER, N. J., and CHICAGO, ILL.

THE UNITED GAS IMPROVEMENT COMPANY

During the Year 1902 has been Awarded Contracts in the Following Places for

Standard Double-Superheater Lowe Water Gas Apparatus.

Atlantic City, N. J.	Flushing, N. Y.	Norristown, Pa.
Ardmore, Pa.	Hollidaysburg, Pa.	Norwalk, O.
Auburn, N. Y.	Houston, Tex.	Ocean City, N. J.
Belmar, N. J.	Indianapolis, Ind.	Oklahoma City, O. T.
Blue Island, Ills.	Jersey City, N. J.	Oneonta, N. Y.
Boonton, N. J.	Laconia, N. H.	Plainfield, N. J.
Brooklyn, N. Y.	Lakewood, N. J.	Portland, Me.
Carlisle, Pa.	La-Salle-Peru, Ills.	Pottsville, Pa.
Champaign, Ills.	Martinsville, Ind.	Scranton, Pa.
Coney Island, N. Y.	Memphis, Tenn.	South Brooklyn, N. Y.
Dallas, Tex.	Newark, N. J.	Suffern, N. Y.
Danville, Ills.	New Brunswick, N. J.	Swedesboro, N. J.
Des Moines, Ia.	New London, Conn.	Syracuse, N. Y.
Evanston, Ills.	New Orleans, La.	Washington, N. C.
Evansville, Ind.	Norfolk, Va.	Woonsocket, R. I.

TOTAL SETS, 1902, ... 51
TOTAL DAILY CAPACITY, 1902, . . 32,825,000 cubic feet.
TOTAL SETS TO DATE, ... 447
TOTAL DAILY CAPACITY, ... 299,670,000 cubic feet.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY, Prest. DAVID R. DALY, V.-Prest. & Treas
H. D. ABERNETHY, Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

MANUFACTURERS OF

CLAY GAS RETORTS, FIRE CLAY TILES,
FIRE BRICK and FIRE CLAY SPECIALTIES

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING GENERATOR GAS FURNACE

Brooklyn Fire Brick Works,

OFFICE AND WORKS:
88 VAN DYKE ST., BROOKLYN, N. Y.
MANUFACTURERS OF

CLAY GAS RETORTS & SETTINGS, GENERATOR LININGS. SPECIALTIES.

Established 1854. Incorporated 1869.

LACLEDE
Fire Brick Manufg. Co.,

Manufacturers of { GAS RETORTS . .
FIRE BRICK . . .
RETORT SETTINGS

Water Gas Cupola Linings, Fire Clay, Etc.

Proprietors for the U. S., Coze System of Inclined Benches.

Estimates Furnished on Application for Most Successful Style of Construction.

Also for Free-Firing and Full and Half-Depth Regenerative Benches, for Burning either Coal or Coke in the Furnaces.

Office:
Cor. Manchester and Sulphur Avenues, St. Louis, Mo.

DETROIT CITY GAS COMPANY,
Detroit, Mich., 3–26–1903.

Mr. Oscar B. Weber,
Care Adam Weber Sons,
Park Row Building,
New York, N. Y.:

Dear Sir: The carbonizing and fuel results of the eight benches of 6's erected by you in 1902 at our station "B" are as follows:

Coal Carbonized. Pounds.	Fuel Used. Pounds.	Fuel Used per Ton Coal Carbonized. Pounds.
Oct., 2,663,060	Coal, 430,000 / Coke, 11,000	331
Nov., 2,668,867	Coal, 405,290	303
Dec., 2,879,810	" 444,000	308
Jan., 2,905,510	" 446,150	307
Feb., 2,630,580	" 393,100	298

I consider these bench fuel results excellent and fully equal to my expectations. The firebrick material and the workmanship on the benches I consider first-class and high grade in every respect. Very truly yours,

(Signed) PAUL DOTY,
GENERAL MANAGER.

NOTE.—Retorts 14 inches by 25 inches by 9 feet 6 inches.

ISAAC C. BAXTER, President. ESTABLISHED 1864. PETER YOUNG, Sec'y and Treas.

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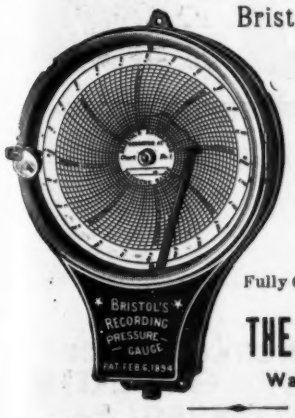

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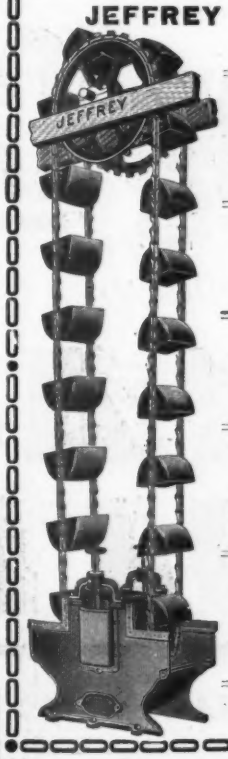

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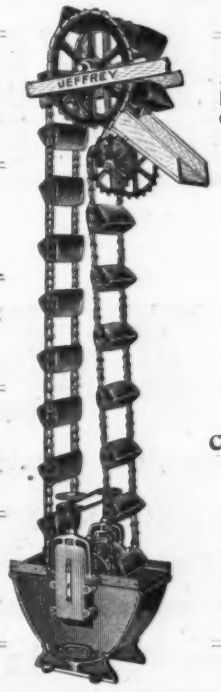

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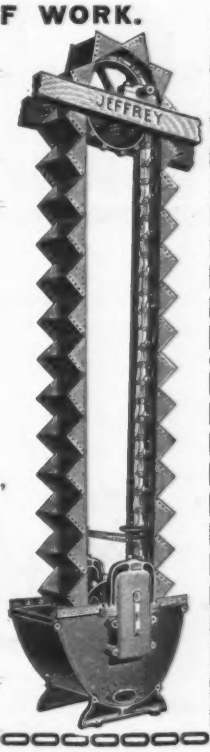

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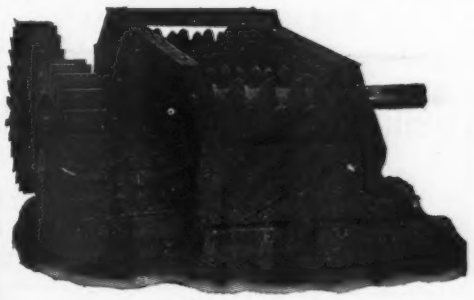

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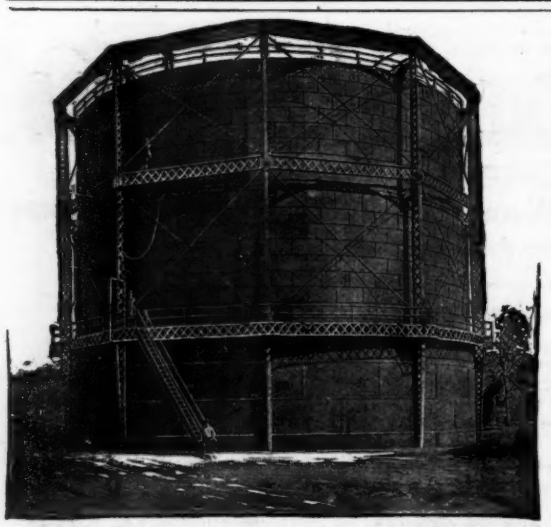

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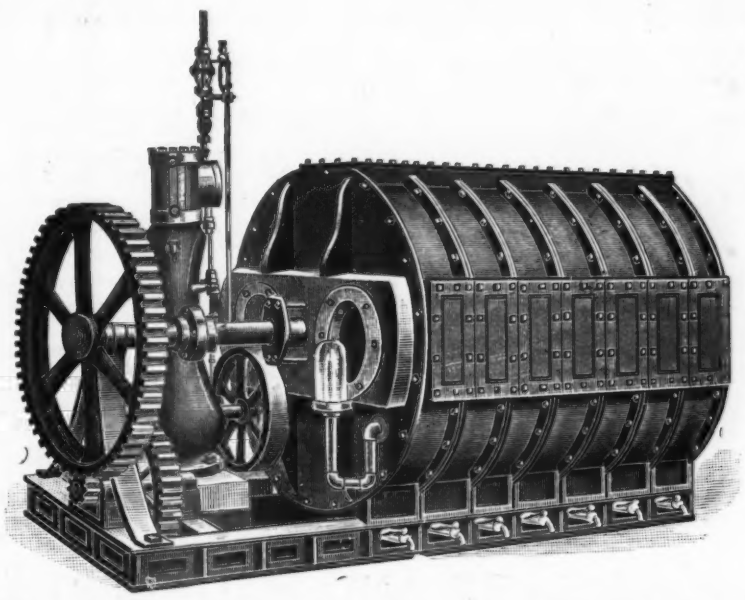

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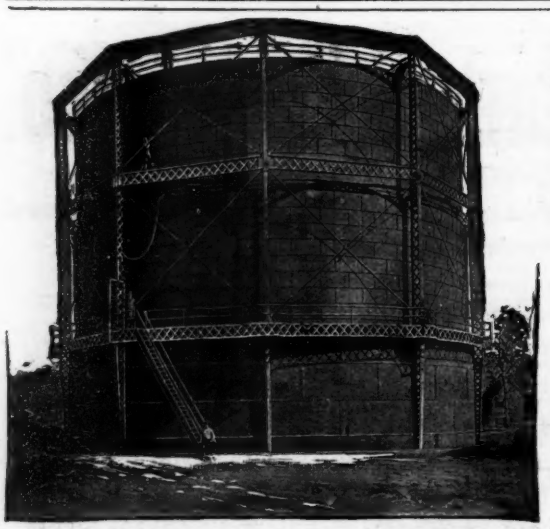

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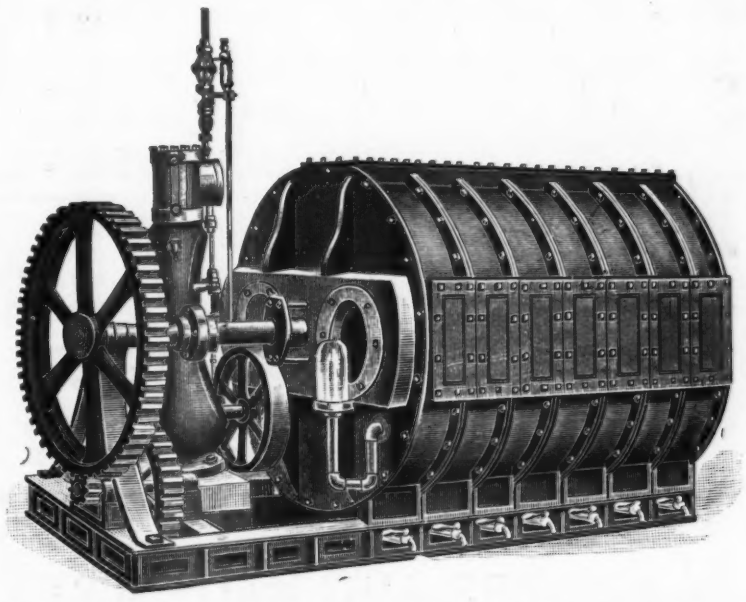

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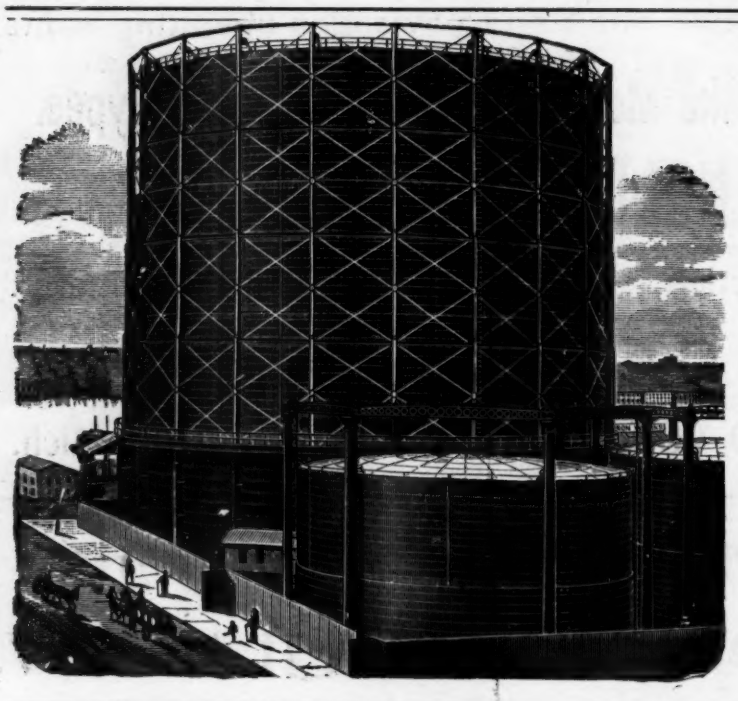

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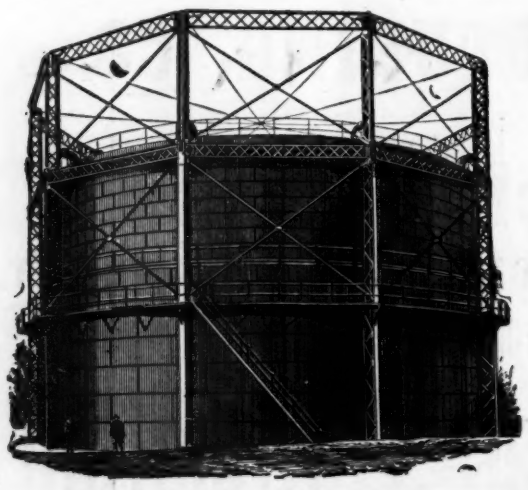

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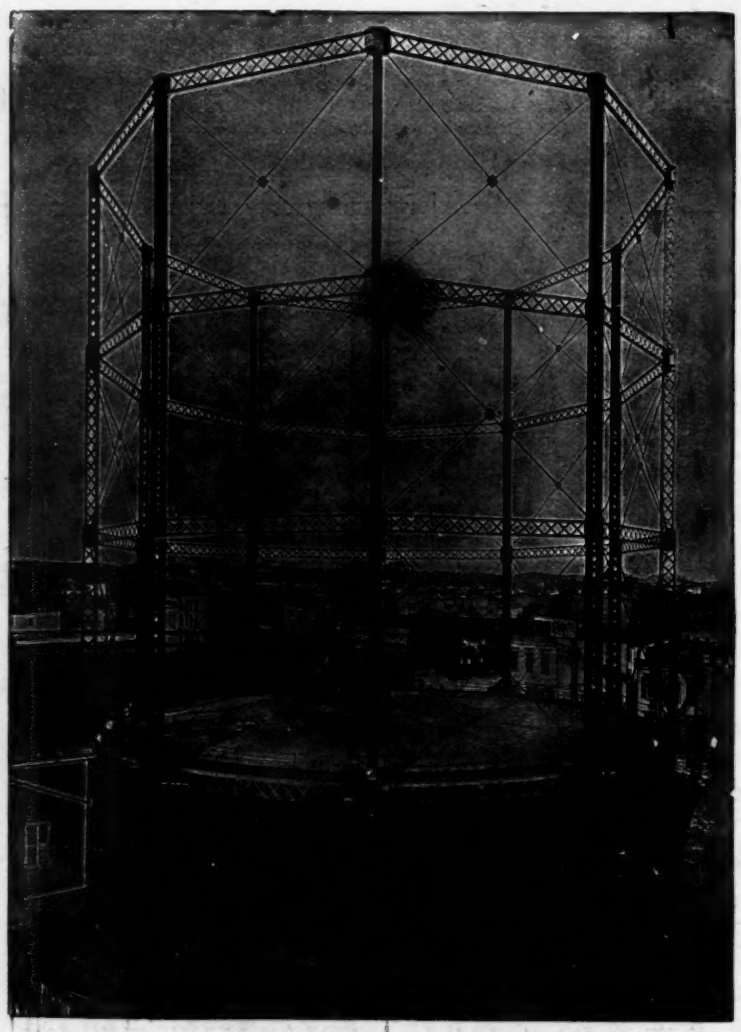

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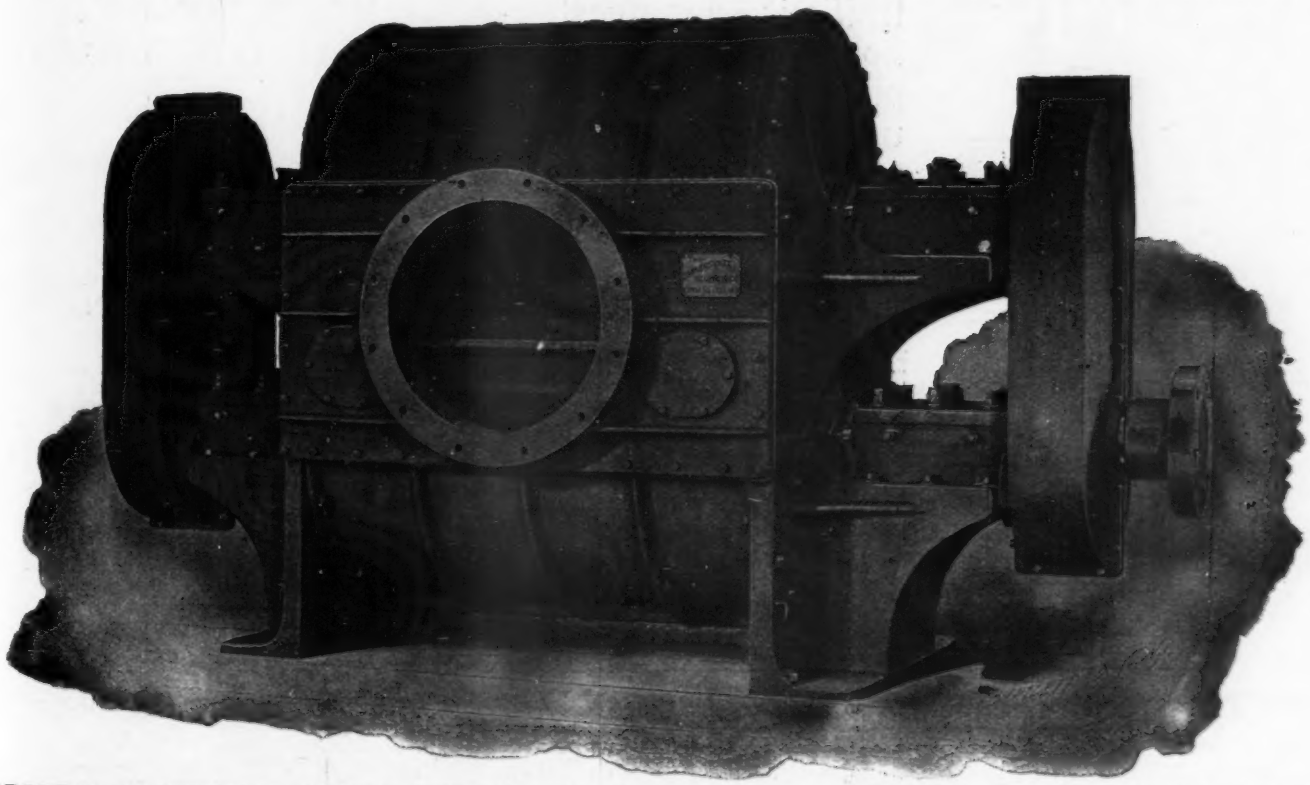

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